COMMERCIAL FERTILIZER

CONSOLIDATED WITH THE FERTILIZER GREEN BOOK

Reliable, Dependable Barrett* Nitrogen Side-dressing Materials

It pays to recommend and sell ARCADIAN*, the American Nitrate of Soda, and A-N-L* Nitrogen Fertilizer. These reliable, dependable BARRETT* Nitrogen materials are ideally suited for top-dressing or side-dressing.

"ARCADIAN," *the American* Nitrate of Soda, is the genuine, old reliable Nitrate of Soda many thousands of farmers have used for many years. It contains 16% or more nitrogen, all-soluble, quick-acting and immediately available. "ARCADIAN" Nitrate of Soda is made in crystals, free-flowing and easy to distribute by hand or machine. It is non-acid-forming and contains no harmful impurities.

"A-N-L" Nitrogen Fertilizer contains 20.5% nitrogen—10.2% in quick-acting nitrate form and 10.3% in long-lasting ammonia form. It also contains 9% calcium oxide equivalent and 7% magnesium oxide equivalent. This material is in pellet form and easy to distribute as top-dressing or side-dressing.

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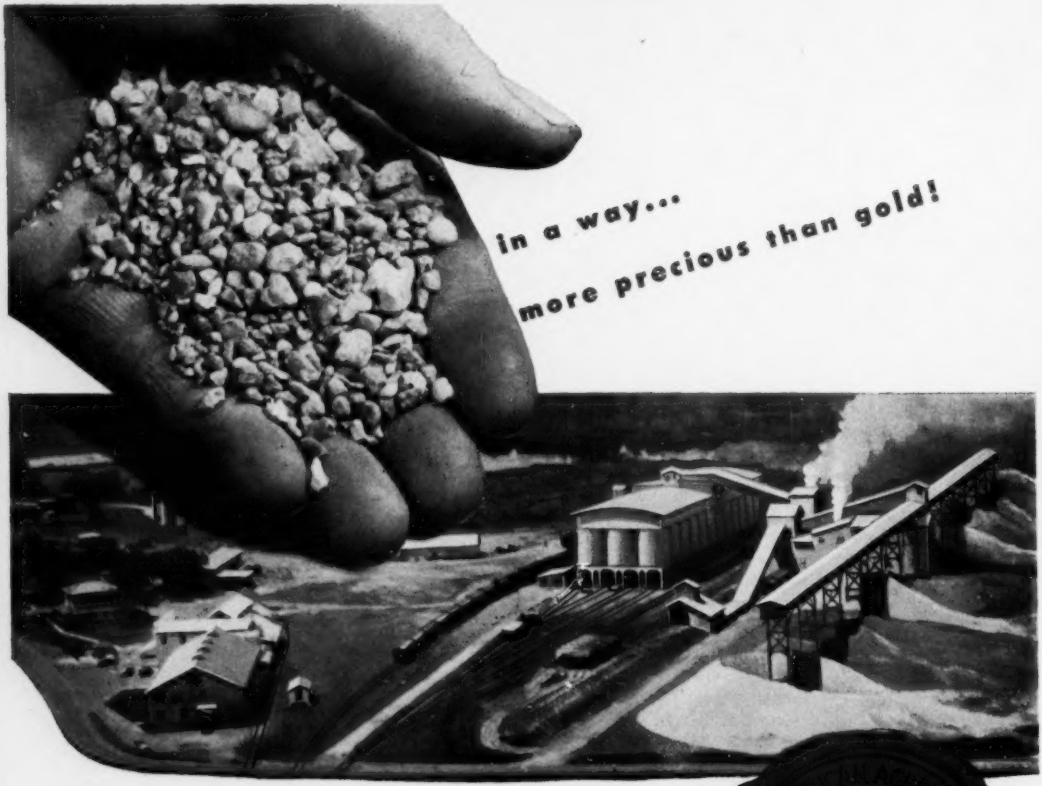
Columbia 1, S. C. • South Point, Ohio • San Francisco 3, Calif.

THE ELEMENT THAT MAKES PLANTS GROW



Air view showing dryers and rock storage at Pierce, Florida, headquarters of A.A.C. phosphate mining operations. (Top) Sample of Florida Pebble Phosphate Rock, source of phosphorus widely used in the chemical industries, in its elemental form as well as in phosphoric acid, phosphates and phosphorus compounds. ¶ This pebble rock is also the principal source of the most important—and most generally deficient—plant food element. Often called the Key to Life, phosphorus is essential in maintaining and improving crop yields. Health, growth, life itself, would be impossible without phosphorus . . . so in a way these phosphate pebbles are more precious than gold.

AA Quality...

for over 85 years a symbol of quality and reliability

principal AA QUALITY products

All grades of Florida Pebble Phosphate Rock **AA QUALITY Ground Phosphate Rock**
All grades of Complete Fertilizers **Superphosphate**
Gelatin **Bone Products** **Salt Cake** **Ammonium Carbonate**
Sulphuric Acid **Fluosilicates** **Insecticides and Fungicides**
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COMMERCIAL FERTILIZER

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May, 1952

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NO. 2 OF A SERIES

ON HOW TO

Stretch a MULTIWALL Paper Bag

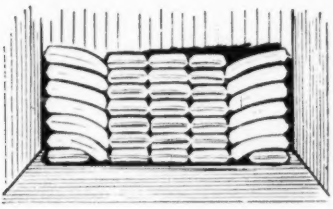
It is just good business to get the best possible use from your multiwalls. Here is one way to do it . . .

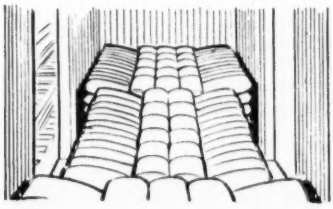
PROPER CAR LOADING

PREPARATION IS IMPORTANT

Cars should be clean, dry, and free from protruding nails or other projections. Remove all dirt, dust, rocks and grit from floor and walls. Remove loose nails and cover loose bolts with cardboard or several thicknesses of car liner. (Picture shows how to use straight-edge board to locate protruding nails, etc.)

Cover floor with good grade of car liner and put at least three thicknesses on door edges. Line walls, too, if they are in bad condition. Use asphalt-laminated paper to seal door cracks against dirt, rain, snow and cinders.





FOLLOW THESE LOADING RULES:

1 The car should be loaded so that the filled bags will not come in contact with side doors.

a. Use a good grade of dunnage in the doorway or steel strapping covered with corrugated board.

b. Follow proper loading patterns. (See illustrations.)

c. Use retaining strips of special Scotch tape applied across the load, or steel retaining straps covered by one thickness of corrugated board.

2 Bags should be loaded tightly, solidly and flat, to minimize shifting in transit.

3 Balance the load so there will not be more weight on one end or side than on the other end or side.

There are, in general, three different methods of loading—crosswise, brickwall and lengthwise. The crosswise method is generally considered to be the most acceptable.

Loading in car doorways should be done in such a manner that this part of the load acts as a keystone between the loads in the ends of the car. (See illustration.)

Want the Whole Story?

Ask your Bemis Man for free, illustrated copy of Bemis Multiwall Packaging Guide. It deals with Storage, Filling and Closing, Handling, Palletizing and other important subjects.

• • •

If you need cotton or burlap bags also, Bemis is your best source.

Bemis

BEMIS BRO BAG COMPANY

St. Louis 2, Missouri

A well planned, efficient fertilizer packaging operation using EXACT WEIGHT Sacking Scales at WEST COAST FERTILIZER plant in Florida.

This Job of Checkweighing – it's Important . . .

In almost every fertilizer plant packaging takes a pretty stiff bite out of total production costs. The important thing is uniform bags, every one alike. Dollar-wise plant operators, realizing this, specify EXACT WEIGHT Scales to keep them in the black. They know that weighing is one of the most vital cost control measures at their disposal. Accuracy means improved quality . . . better uniformity . . . saved dollars. Illustrated are two EXACT WEIGHT Sacking Scales that handle, weigh and check in one operation at the speed of 5 to 8 bags per minute. Today these famous sacking scales are doing more varied jobs in more chemical plants than at any time during the 35 years we have served this industry. The reason? They save time, money, product and labor which all adds up to the lowest costs possible. Write for details for your plant.

SALES and SERVICE
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from Coast to Coast
and Canada.

EXACT WEIGHT SCALES
Industrial Precision
THE EXACT WEIGHT SCALE COMPANY

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Application of 10-10-10 on pasture brings $13 return for every dollar spent for Armin Piel,

FOUNTAIN CITY, WIS.

"Last year," says Armin Piel, Fountain City, Wis., "I conducted a test to compare for my own satisfaction the forage yield on fertilized and unfertilized land. The land was pasture that had never been plowed.

"I applied 500 pounds of 10-10-10 fertilizer on an acre of Kentucky blue grass pasture and the yield was 13,875 pounds of dry matter. On an acre unfertilized, the yield was 4,125 pounds. The 10-10-10 meant an increase of 9,750 pounds of dry matter.

"Valuing this increase in terms of a 10% dairy protein feed, I figure the return was $243.75. Figuring the cost of the 10-10-10 at $18, my return was better than $13 for every dollar invested and there was practically no labor inolved."

Bigger yields for farmers mean better business for you

● Dollars-and-cents figures like these impress farmers with the value of high-nitrogen complete fertilizers. They see how they can increase both quantity and quality of crops without an appreciable increase in labor.

Make use of data like this in your own promotional efforts on high-nitrogen fertilizers. They'll pay off for you in steadily increasing sales of these materials.

And to give farmers the type of fertilizers that will yield the best returns, use U·S·S Ammonium Sulphate to supply a major part of the nitrogen content. It contains nitrogen that won't leach out during spring rains, yet converts to readily available form in the growing season. U·S·S Ammonium Sulphate is dry and free-running . . . won't set in storage . . . doesn't clog drills or other distributing equipment.

For complete information, contact the nearest district sales office or write to United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

U·S·S AMMONIUM SULPHATE

2-657

UNITED STATES STEEL

JUST AROUND THE CORNER

By Vernon Mount

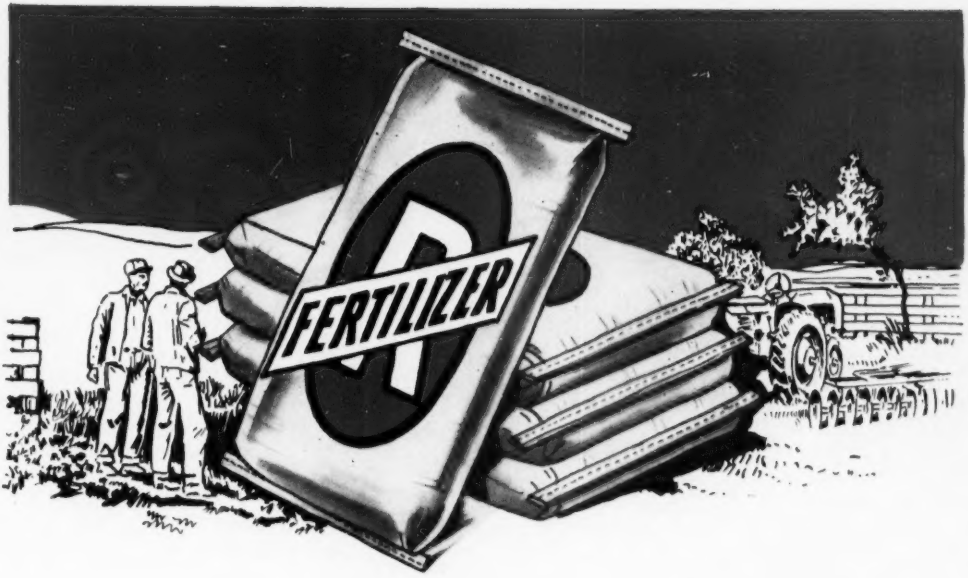
WE CAN BREATHE A LITTLE EASIER, now that it has been adjudged illegal for a President to consider that his office gives him inherent rights to seize any industry when, in his opinion, it is for the good of the people. A benevolent autocracy could be a fine thing, but only if we could always be sure we had a wise and benevolent autocrat in office.

WE HAVE PERMITTED many things of doubtful constitutionality in the past twenty years or so. We have relaxed vigilance and permitted the passage of many laws which vitiate our basic rights...laws with weasel clauses in them. We have accepted many of these as inevitable when perhaps they were not, just as we have accepted secret treaties and hidden chicanery and weird official bookkeeping--with a shrug.

WE MUST STOP SHRUGGING, and keep a keen eye on what happens in Washington; what is done by Washington, from the President down. For if we do not, we are headed into the pattern which brought Italy and Germany into the Fascist grip.

Yours faithfully

Vernon Mount



Today, fertilizer is BIG BUSINESS ON EVERY FARM

Our hats are off to the fertilizer industry for meeting the tremendous demand for commercial fertilizers.

We are proud of the fact that many of the leading producers, packers, and shippers of fertilizer pack and ship their products in Raymond Multi-Wall Paper Shipping Sacks.

These tough, strong, dependable Paper Shipping Sacks are CUSTOM BUILT. Made in various sizes, types, and strengths, they are available printed or plain.

They're Dust-Proof! Sift-Proof! Water-Resistant!

A Raymond representative will be glad to assist you in selecting the perfect Raymond Multi-Wall Paper Shipping Sack for your special requirements.

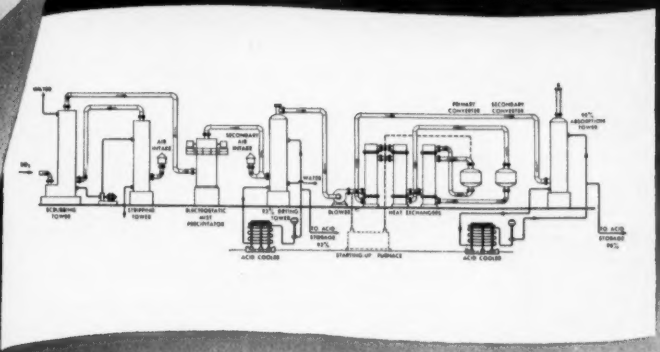
Phone, write, or wire Raymond today.

THE RAYMOND BAG COMPANY
Middletown, Ohio

RAYMOND *MULTI-WALL* PAPER SHIPPING SACKS

SO_2 up the stack....

...wastes a valuable source of H_2SO_4



You can produce much-needed sulfuric acid at a profit, if you have by-product sulfur dioxide in suitable quantity and strength from your chemical or smelting operations. The Chemico process, diagrammed above, or modified to suit specific conditions, provides a practical, efficient method for converting SO_2 into clean sulfuric acid. Chemico will design and construct the complete plant . . . deliver it in smooth-running operation on a performance-guaranteed basis. For specific recommendations, write us describing your problem fully.

This diagram shows how SO_2 gas is purified, dried, reheated and converted into H_2SO_4 of any desired strength.

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Chemico plants are profitable investments

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Pulp wood from I.P.'s own woodlands, converted into kraft at I.P.'s own paper mills, and made into bags in I.P.'s own bag plants. Practically everything that goes into the manufacture of a Bagpak bag is furnished by the facilities of International Paper.

"you can bank on Bagpak!"

Bagpak has been manufacturing multiwall paper bags since 1928 — makes all kinds of multiwalls, in basis weights to meet any strength required, in a complete size range, without printing or with "non-smear" printing up to four colors.

"you can bank on Bagpak!"

Five different I.P. Mills supply bag kraft — not only Natural but also Colored Kraft Paper, as well as Polyethylene Liners, Asphalt Laminated Kraft and Wet Strength Paper. Each bag mill is located on two or more different railroads. Two traffic departments assure prompt delivery.

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for heavy duty multiwall bags: — bags, bag closing materials, car liner, palletized shipments when required, packaging machines and scales — all from one source of supply! Staffs of experts help you with bag designs and packaging problems.

"you can bank on Bagpak!"

All these go into the business of providing you with a dependable supply of multiwall paper bags. For the answer to any particular multiwall bag problem, write to:

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With supply lines around the world, we can furnish manufacturers of fertilizer and agricultural chemicals with essential raw materials. When you have a problem, write, wire or phone us.

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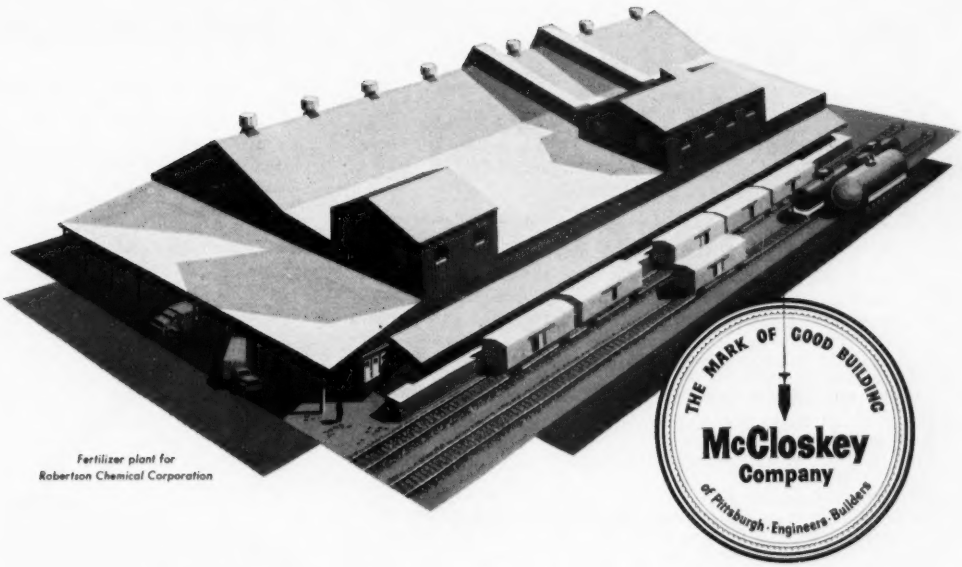


Fertilizer plant for Robertson Chemical Corporation

You Get Sound Design, Efficient Construction With McCloskey Fertilizer Plants

The design of your plant is based upon sound engineering principles when you retain McCloskey to plan and erect your new fertilizer processing unit. For, back of "The Mark of Good Building" is the experience gained in designing a number of fertilizer plants which is reflected in our modern approach to the many specialized problems involved in such an operation.

The design helps combat the destructive effects of corrosion—ample room for overhead conveyors is provided by elimination of outdated truss construction—high stacking of material is made practicable —the need for a plant of eccentric shape is provided for. All these vital elements of design are included in your plant when you retain McCloskey to plan and develop your expansion program.

The construction of your new plant gets under way fast when directed by our field engineers. They employ many cost-reducing and time-saving methods that mean your plant is ready for operation faster, your total investment is less than you would expect. You have no details to worry about, the entire project is covered by your one contract with McCloskey.

Some of the best names in the fertilizer industry use McCloskey design and construction service again and again in planning and completing their expansion programs. It will pay you, while your plans are still in the thinking stage to draw upon our experience—you will find it invaluable. Without obligation, we invite you to ask for a consultation. Write McCloskey Company of Pittsburgh, 3412 Liberty Ave., Pittsburgh 1, Pennsylvania.

McCloskey Company

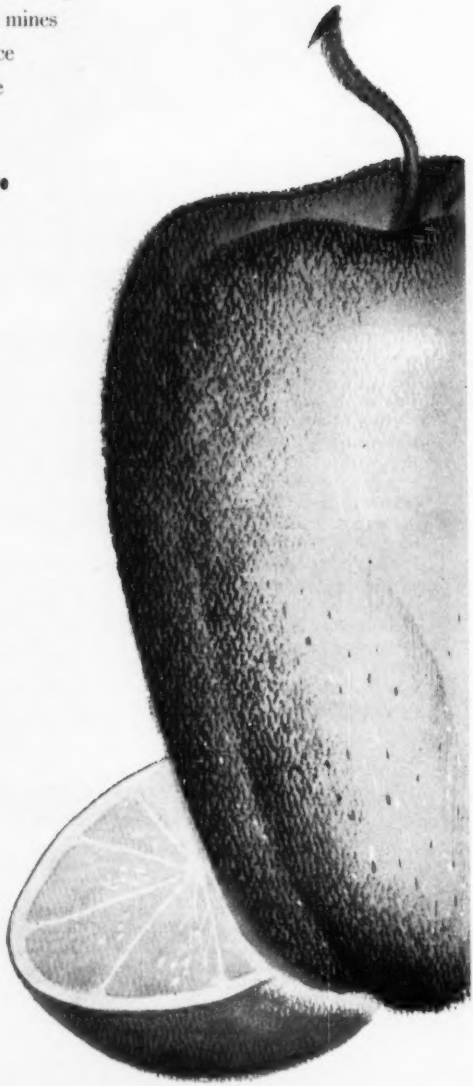
of Pittsburgh

Engineers - Builders

high grade International phosphates

Ample resources for prompt deliveries of large tonnages from *International's* modern mines and plants in Florida at Noralyn, Peace Valley, Achan, Mulberry; in Tennessee at Mt. Pleasant and Wales.

- **phosphate for the manufacture of complete plant foods**
- **natural ground rock phosphate for direct application to the soil**
- **phosphate for the manufacture of industrial chemicals**



International MINERALS CHEMICAL PHOSPHATE DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6.

WASHINGTON

Emergency Meetings In Flood States

Secretary of Agriculture Charles F. Brannan called emergency meetings of State Agricultural Mobilization Committees in 10 Midwestern States affected by disastrous floods in the Missouri and Upper Mississippi River valleys. The Committees were requested to report on distress conditions affecting agriculture, the extent of damage, and the type of assistance which flooded farming areas would require in order to get underway the return to full productivity. The assistance of County Agricultural Mobilization Committees was also asked in obtaining accurate information about the flood.

POTASH IAC

Members of the Potash Industry Advisory Committee met April 10 with Office of Price Stabilization officials to consider ways and means of effecting industry price relief because of rising production costs. It was the second meeting of the committee and the session was held at the industry's request.

Discussion developed the committee conclusion that the Capehart Amendment seems the only expedient which holds promise for price relief in the imminent contract year. Four of the five producers of potash have applied formally under the Capehart Amendment and these applications are now being considered by OPS.

Committee members urged that, if possible, the agency give priority to these applications in an effort to determine their validity before June 1.

Another suggestion was that adjustable pricing provisions be used in new contracts so that producers might designate the present ceiling price or a new ceiling price to be effective if and when OPS acts upon the Capehart Amendment applications.

Members of the committee present were: Horace Albright, President, United States Potash Company, New York City; A. Norman Into, Vice President, Potash Division, International Minerals & Chemicals Corp., Chicago; W. J. Murphy, Vice President, American Potash & Chemical Corp., New York City, and George E. Petitt, Vice President, Potash Company of America, Washington, D. C.

It Seems to Me

by BRUCE MORAN

Time was when a half million dollar fertilizer plant commanded headlines in our pages. Today multi-million dollar projects are reported in a few lines in "Around the Map", they come so often.

I've heard men worry about this tremendous expansion of our industry, forgetting that it doubled sales in ten years . . . sales, not just production, for you cannot store up very much fertilizer. And those were tonnage gains, not just dollar volume.

Those who worry forget that fewer men and more machines work fewer farms and larger acreage these days. They forget there is only one way to keep up with the appetite of increasing populations and that is to fertilize well, mechanize thoroughly—and protect the crop with pesticides.

Unless the world commits race-suicide, or mass murder on a scale hitherto unknown, the demand for the products of the soil will, in the long run, justify every one of the many, many millions of dollars going into fertilizer plant construction.

At least, so it seems to me.

INDUSTRY CALENDAR

Date	Organization	Hotel	City
June 16-18	NFA	Greenbrier	White Sulphur
June 19-22	APFC	Homestead	Hot Springs
June 23-27	Canadian	Seigniory Club	Montecello
Aug 17-23	Grasslands	Penn State	State College
Nov. 10-12	CFA	Desert Inn	Palm Springs

Agricultural Liming Material

The rates and charges for the transportation and spreading of agricultural liming materials have been exempted from price controls, the

(Continued on page 54)

NFA MEETING JUNE 16-18

Expectations are that the June convention of National Fertilizer Association, to be held at the Greenbrier, White Sulphur Springs, June 16-18, will be one of the most well attended, as well as one of the best in the long history of NFA.

The program is studded with star speakers, and the entertainment sounds like real fun.

An open meeting of the Plant Food Research Committee will be the first event open to those attending, featuring a presentation by the subcommittee on Chemical Processing and Manufacturing. Discussion will be by Chairman, George V. Taylor, Spencer Chemical Company; Edwin C. Kapusta, NFA, secretary; Richard E. Bennett, Farm Fertilizers; F. W. Darner, U. S. Phosphoric Products Division, Tennessee Corporation; Leroy Donald, Lion Oil Company; R. M. Jones, Barrett Division, Allied Chemical and Dye Corporation; R. A. MacDonald, International Minerals and Chemical Corporation; G. F. MacLeod, Sunland Industries; and H. B. Siems, Swift and Company.

The Garden Party for the ladies will be held at 4 o'clock in the Old White Patio.

The first general meeting scheduled for Tuesday, 17, will include addresses by The Honorable Karl E. Mundt, U. S. Senator from South Dakota, on "Where To In '52?"; by John H. Stambaugh, Assistant to the Secretary of Agriculture, on "Agriculture—An American Business Opportunity;" and by J. E. Totman, Chairman of NFA's Board of Directors, who will present his annual convention address. At 2 o'clock on the same day, the Ladies' Bridge Party is scheduled.

Tuesday evening has been designated as Festival Night with four major features. At 6 o'clock International Minerals and Chemical Corporation will offer a Refreshment Hour. At 7 o'clock, dinner, and at 9 o'clock the nationally famed quartette, The Skyliners, will present a half-hour of songs and musical novelties. At 11 o'clock, dancing in the ballroom to the tunes of a Meyer Davis orchestra.

On Wednesday, the second General Meeting will open with Milton S. Eisenhower, president of The Pennsylvania State College, on "Framework for Peace;" Allan B. Kline, president of the American Farm Bureau Federation, on "Our Agriculture and America's Defense;" and NFA President Russell Coleman's annual convention address.

The following have accepted chairmanships for various convention committees: Mrs. J. E. Totman, Ladies' Hospitality; Mrs. E. M. Kolb, Ladies' Golf; Mrs. J. A. Naftel, Ladies' Bridge; Committee for Golf and Men's Golf Events, R. S. Rydell; Horseshoe Pitching Contest, A. A. Schultz; Tennis, George Burns; Men's Hospitality, Gene Van Deren.

CFA Soil Program "In High Gear"

The fund raising program to finance the Soil Improvement Council sponsored by California Fertilizer Association is "getting into high gear" according to word from Sidney H. Bierly, Exec. Secretary. The program includes specific research work which is being done by the University of California, under determination annually by the Soil Improvement Committee. Another continuing commitment is the annual fertilizer essay contest.

The Council is bringing emphasis to bear on the proper fertilization of irrigated and dry pasture lands, of which there are more than 1,700,000 acres in California.

KLINE

MUNDT

STAMBAUGH

EISENHOWER

APFC MEETING JUNE 19-22

A record attendance of more than 500 fertilizer manufacturers and leaders in the fields of agriculture, education, and research and government is expected at the Seventh Annual Convention of the American Plant Food Council to be held at The Homestead, Hot Springs, Virginia, June 19-22, 1952.

The program for the 1952 Convention is woven around the importance of fertilizer to the national welfare with emphasis on the major factors influencing the future of farming and the relationship of fertilizers to the food economy.

"The Department of Agriculture appropriately has emphasized that the world shaking events of the past year have speeded American agriculture over the threshold of a new era, an era which they emphasize 'might be called the fertilizer era'. We heartily concur with the agricultural leadership in the observation that the present national emergency has pushed agriculture into a new phase of development in which the fertilizer industry will play its greatest role in history. With this thought in mind we believe the distinguished speakers at our 1952 Convention will discuss in a down-to-earth fashion the far reaching contribution the fertilizer industry will make to the Nation's farmers," said Paul T. Truitt, Counsel President.

U. S. Senator Harry F. Byrd will be the principal speaker at the banquet session of the Convention at 9:00 p.m. on Saturday, June 21. The Convention will hear outstanding soil scientists, economists, farm organization, Congressional and U.S. Department of Agriculture leaders at the morning sessions on June 20 and 21.

Speakers on Friday, June 20, will be: Paul T. Truitt, who will deliver the Presidential address at 9:45 a.m. Professor C. J. Chapman, Extension Specialist, Soils, University of Wisconsin at Madison, who will speak on "Pasture Improvement by Direct Fertilization" at 10:30 a.m. Dr. H. F. DeGraff, H. E. Babcock Professor of Food Economics, Cornell University, Ithaca, N. Y., on "Fertilizer's Relationship to the Food Economy" at 11:00 a.m.

The first day of the Convention will be concluded with the annual business session at which eight new members of the Council's Board of Directors will be elected.

Rep. Harold D. Cooley (D-N.C.), Chairman of the House Committee on Agriculture, will be the first speaker on the Saturday morning, June 21, program, beginning at 9:45 a.m.

Following this there will be a panel discussion on "Major Factors Influencing the Future of Agriculture" with Dr. Paul D. Sanders, Editor of The Southern Planter, Richmond, Va., as moderator. Other panel members are: Dr. Byron T. Shaw, Administrator, Agricultural Research Administration, USDA, O. V. Wells, Chief, Bureau of Agricultural Economics, U.S.D.A. D. Howard Doane, founder of the Doane Agricultural Service, St. Louis, Mo; and Herschel D. Newsom, Master, The National Grange, Washington, D. C.

W. A. Minor, Assistant to the Secretary, USDA and Chairman of the USDA's Fertilizer Policy Committee, will be the final speaker on the Saturday morning program. His subject will be "We Too Have A Job To Do."

Committees for the 1952 Convention thus far selected are: Executive and Convention: George E. Petitt, Potash Company of America, Chairman; C. Cecil Arledge, Virginia-Carolina Chemical Corp.; John V.

(Continued on page 28)

SHAW

COOLEY

BYRD

SANDERS

Pyrites roasting

By Dr. L. Falugiani, *(Montecatini, S. A. Italy)*

Foreword

The shortage of elemental sulphur in the world market renders the subject of producing sulphurous gases by roasting Pyrites one of interest, even in countries which normally find it more convenient to use Sulphur.

Furthermore, the same sulphur shortage and the improvements in the methods of selective flotation have induced Pyrites producers to exploit low grade deposits and deposits of complex minerals, so that the quantity of flotation pyrites concentrates available in the world market has increased, such concentrates being extremely fine in size of particle (90 to 95% passing through 100 mesh).

We believe it of interest to review the apparatus at present in use for the production of sulphurous gases from Pyrites with some observations justified by our experience as producers in a country, Italy, where the cost of crude sulphur has always been too high as compared with the sulphur content in Pyrites for the production of sulphurous gases in full-scale plants.

The furnaces now in use for roasting Pyrites are of four types: mechanical multiple hearth furnaces; rotary furnaces; flash roasters; fluo-solid furnaces.

Whilst mechanical multiple hearth furnaces were introduced in the industry some 70 years ago, rotary furnaces some 25 years ago, and flash roasters some 20 years ago, fluo-solid furnaces are only just coming into use in the last few years, and must therefore be considered as a novelty, particularly for use in the production of sulphurous gases destined for the manufacture of sulphuric acid.

Mechanical Multiple Hearth Furnaces are those most in use to-day. They are constructed by many firms (Nichols-Herreshoff; Lurgi; Moritz; Nouvelle Induschimie; Montecatini etc.) and to-day the larger capacity type of furnace, as generally preferred; up to 30 to 40 tons per day of Pyrites with a 50% sulphur content, as compared with 5/10 tons per day in the past. This development has been brought about by the need to avoid multiplying the number of furnaces in plants with a large production of sulphuric acid, and has been made possible by some detailed improvements which have eliminated the major difficulties which in the past made the use of large dimensional furnaces inadvisable.

Among these improvements should be mentioned the following: (a) The increase in the quantity of Pyrites which it is possible to burn per unit of surface of the roasting hearth and per unit of time. (up to 150 kilos per sq. m. per day, as compared with 90 to 100 kilos per sq. m. per day) by controlling the maximum temperature which is usually reached in the second or third hearth of the furnaces. With this object in view, our company has, by sub-dividing into two circuits, separated Pyrites and gas in the first phase of combustion, as already mentioned at the preceding congress, and as described in the Italian patent No. 353,401, which process has already been patented in many other countries.

(b) The adoption of rabble arms and teeth in chrome nickel steel in the place of less resistant and heavier rabble arms in cast iron, which with the action of time and high temperatures become progressively sulphurised, with consequent deterioration, particularly of the teeth, and reduction of resistance. Rabble arms in alloy steel are generally produced by fusion. Our Company has successfully experimented and now adopted the use of rabble arms constructed in laminated welded steel 18/8, and also even in ordinary heat-treated laminated steel. Thus rabble arms of a lighter type are obtained which can be readily repaired (straightened, teeth renewed etc.) in the works where they are employed.

(c) The construction of the casting in prefabricated slabs, cast in wooden or iron moulds, made of a mixture of aluminous cement and refractory material, and pouring on the spot the same mixture for the hearths, which in this way are made in one piece.

With these improvements, which evidently can also be realised in existing furnaces, the production can be considerably increased, and the working of this type of furnace, made considerably easier which should be considered as having now reached the limit of its technical evolution.

Rotary Furnaces

The application of the rotary type of furnace to the roasting of pyrites was realized by Lurgi, and has been particularly welcome in large capacity plants. These are furnaces which in the most suitable types have a roasting capacity of 60 to 80 tons per day of pyrites containing 45 to 50% S.

Since it is not generally advisable to base the production of a sulphuric acid works upon the sulphurous gases produced by only one furnace, it can be seen that the capacity of a plant of this type should be 150 to 200 tons per day.

This type of furnace is sufficently well-known for it not to be necessary for us to describe it here. We would simply draw attention to the fact that in this type of furnace, in which the pyrites in combustion are continually lifted and allowed to fall back in the interior of the cylinder through which the gas pass-

This paper was presented at the Technical Meetings of the I.S.M.A. in Paris.

Type of Furnace	Hearth	Rotary	Flash Roasting
Furnace exit gas SO_2%	6/8	8/10	12/14
Cinders removed by the gas % of total	2/3	12/15	20/25
Maximum temperature in the furnace ° C.	750/800	850/900	1000/1200

es, there is already a process which foreshadows the use of furnaces for pulverized pyrites. In other words, a rotary furnace can be considered as an intermediate apparatus between the multiple hearth furnace, where the roasting takes place principally upon the hearths, and the flash roasting furnace, where the roasting takes place entirely while the particles are falling into the combustion chamber.

Naturally it follows that all the characteristics involved by this more or less intimate contact between the material in combustion and the gas producing the combustion assume in the rotary furnace an intermediate value between that usually obtained in mechanical hearth furnaces and those obtained in flash roasters, as can be seen from the following table:

Also in this type of furnace the use of nickel chrome steel has been adopted for the spoon-shaped flights situated in the interior of the furnace, particularly in the first zone where the first atom of sulphur of the pyrites distils and burns with the characteristic long violet-colored flame, and where the flights deteriorate most rapidly. Other detailed improvements have made it possible to operate these furnaces practically continuously for periods of up to 3 or 4 years. After that time it is necessary to shut down the furnace and repair the worn parts, which involves a shut-down of 3 or four months.

One of the constructional principles of a rotary furnace is that it makes use of the considerable external surface of the furnace to disperse of heat, and thus the thickness of the refractory material is adjusted, so as to regulate by such heat dispersion the temperature of the material to be roasted, in order to avoid it becoming sintered.

It is evident that where the recovery of waste-heat from the sulphurous gases for the production of steam is desirable, this characteristic becomes a disadvantage.

With rotary furnaces it is possible to use granular pyrites of a size similar to those used in hearth furnaces, but to ensure a satisfactory de-sulphurization, it is desirable that the maximum size of the particles should not exceed 5 mm.

Flash Roasters

The most widely-known furnace of this type is constructed by Nichols-Freeman. This furnace has a wide application, both to take advantage of the availability of, flotation pyrites and on account of the considerable amount of steam which can be produced (3 kilos per 1 kilo of S contained in the pyrites).

Other advantages are the facility and rapidity with which the furnace can be started and stopped and the high SO_2 concentration of the gas obtained (up to 14%).

As is known, in this type of furnace, the temperature can be regulated so as to avoid sintering the cinder and incrustation of the walls by circulating the sulphurous gas taken by a suitable fan at the bottom of the boiler or better at the bottom of the electrostatic dust-precipitator and re-introduced into the combustion chamber.

In one Italian works a flash roaster is now being installed designed by Ing. Garbato, in which instead of reducing the temperature of the combustion chamber, it is being increased so as to reach maximum temperatures exceeding 1200°C by pre-heating the combustion air to about 300°C. The advantages which the designer expects to obtain are:

(1) Elimination of the recycling of the sulphurous gases;

(2) Improved heat recovery;

(3) Agglomeration of the cinders, making them easier to handle, and reducing the quantity of dust removed with the gases leaving the furnace;

(4) Larger quantity of pyrites roasted per unit of volume of the combustion chamber per unit of time.

In order to avoid incrustation, the designer proposes to cool the walls of the furnace by protecting them with the tubes constituting the boiler.

The danger of insufficient desulphurization due to reduction of the contact surface between the gas and raw materials, if the latter by melting should agglomerate in masses of a certain thickness, seems to be avoided, since the cinders are mostly composed of minute hollow porous spheres with very thin surfaces.

Flash roasters to be supplied with pyrites which pass practically entirely through a 100 mesh screen. If this fineness has not been obtained for example by the requisites of the flotation process, the necessity for grinding and drying the pyrites reduces considerably the advantages of this type of furnace.

Fluo-Solid Furnaces

This type of furnace was introduced originally some five years ago for the de-sulphurization of auriferous pyrites by the American Dorr Company in a Canadian plant, but without utilising the sulphurous gases.

A furnace based on similar principles has been working regularly for some six to seven months at the Ludwigshafen sulphuric acid plant owned by the Badische Anilin and Soda Fabrik.

This type of furnace is composed of a cylindrical combustion chamber with refractory walls with a laminated steel casing, the bottom of which consists of a grating through which a current of air is blown in and which maintains in suspension, fluidifying it, a stratum of pyrites in combustion about 50 cm thick.

Suitable apparatus prevents the material in combustion from fall-

(Continued on page 46)

PHOSPHORUS DEFICIENCIES IN PLANTS[1]

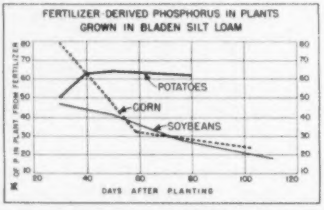
By M. H. McVICKAR,
Chief Agronomist, The National Fertilizer Association

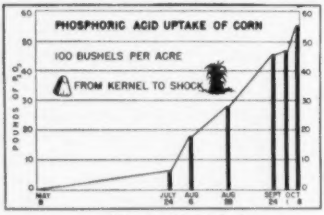
Phosphorus has often been referred to as the key of life. It is definitely known that all plant cells contain phosphorus compounds and that phosphorus is necessary for cell division, basic to the growth of plants. Phosphorus is concentrated in the growing tissue of the tips and shoots and as the plant matures large quantities move into the seed. When plants approaching maturity become starved for phosphorus, the developing seeds will accumulate this nutrient at the expense of all other tissues.

The amount of phosphorus needed, of course, varies for the different crops. Information is available on the phosphorus content of most of our important crops. Table 1 gives data for several of them.

Each year we remove from our soils through crop harvest some 1,700,000 tons of P_2O_5. This, of course, does not take into consideration the loss due to erosion or leaching. Last year our farmers returned through the use of chemical fertilizers just about the same amount removed by harvested crops.

The phosphorus used by a crop, for all practical purposes, comes entirely from the soil's phosphorus supply or from fertilizer. Figures on the amount of this nutrient returned to our soils do not present a true picture. A large part of the phosphoric acid applied to soils reacts with materials in the soil to fix or absorb it; then it is only very slowly available to the plant. Thus, the amount of phosphoric acid applied must be large enough to take care of the soil's "fixing-power" and leave some over for the plant. Fixation is usually much less on sandy soils than on heavy soils. The use of





Charts 3 and 4

comparatively large amounts of phosphoric acid over the years gradually fills the soil's hunger for phosphate. Therefore, on soils heavily fertilized with phosphate for several years, the phosphoric acid needed at least approaches the amount removed in the harvested crop. Generally speaking, newer soils, especially heavy soils, require large amounts of phosphoric acid for most profitable yields.

Then, too, soil reaction—soil acidity or alkalinity—greatly influences phosphorus availability. The most favorable range for high availability is pH 6.0 to 7.5. (Chart 2) Below pH 6.0 the influence as regards availability rapidly becomes less favorable. This is one of the very important reasons why acid soils should be limed to bring them up to approaching a neutral reaction. Without a doubt, if liming produced no other benefit, its favorable influence on phosphorus availability would usually pay the bill. At pH 6.0 to 7.5, lime is sufficiently abundant and available to keep a considerable portion of the phosphorus in the form of calcium phosphate, which is soluble in carbonic acid and hence is readily available to crops. This holds for both the phosphorus naturally present in the soil and that applied as fertilizer.

When lime is present or added in amounts so as to raise the pH beyond 7.5, the influence on phosphate availability gradually becomes less favorable, although this is usually not serious until the pH goes beyond approximately pH 7.8 and there is 2 to 3 percent or more free calcium carbonate present.

Of course, the supply of phosphorus, like all other plant-food nutrients, must be kept in balance with the other elements. The easiest way to develop a phosphorus deficiency is to raise nitrogen and potash to very high levels. When this is done, even though large amounts of phosphorus are present in the growing media—enough for normal

TABLE 1
THE P_2O_5 CONTENT OF CERTAIN CROPS, IN POUNDS

Crop	Total, entire above-ground portion of plant	Seed	P_2O_5 per lb. of crop
Corn, 60 bushels	35	23	.0068*
Wheat, 30 bushels	20	16	.0089*
Sugar Beets, 15 tons	45	22 (roots)	.0007*
Tomatoes, 10 tons	35	20 (fruit)	.0010*
Soybeans, 25 bushels	40	35	.0233*
Celery, 350 crates	65		.0029
Timothy, 1½ tons	15		.0050
Alfalfa, 3 tons	35		.0058

*Seed, fruit or roots.
Source: American Potash Institute

1 Presented at Section O of the American Association for the Advancement of Science meeting.

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development—the plant soon develops the characteristic phosphorus hunger signs. Perhaps this condition could be better called nitrogen and potash toxicity. Regardless of whether it's a phosphorus deficiency or toxicity of the other two primary plant-food elements, the effect is the same—that is the physiological function within the plant is upset.

The stimulating effect that soluble phosphates exert on young seedlings is well known. Oftentimes a very small quantity of this plant food put down as a fertilizer at seeding time makes the difference between a good crop and no crop at all. Unless the young plant has ample phosphorus in an available form, close at hand, it starts off slowly and often is overrun by weeds. After the plant has become well established, the more extensive root system is able to gather the phosphorus needed for normal growth and development.

Permit me to present data collected at North Carolina Agricultural Experiment Station by Doctors B. A. Krantz and W. L. Nelson. These workers used radioactive phosphorus and conducted their experiment on Bladen silt loam. (Chart 3) This soil had a pH of about 5.5 and contained a high level of soil phosphorus. Their findings: The percentage of the phosphorus in the corn and soybeans derived from the fertilizer was similar, but strikingly different in the potato plant. The potato derived about 60 percent of its phosphorus from the fertilizer throughout the growing season. The percentage of phosphorus coming from the fertilizer in the corn and soybean was high early in the life of the plants but decreased as the plants matured.

The difference in phosphorus absorption between potatoes and corn may be related to the nature of the root system. Potatoes, a short-season, rapid-growing crop, have a limited root system. On the other hand, corn, a long-season crop, has an extensive root system and hence may absorb a relatively large amount of soil phosphorus during the late stages of growth. During

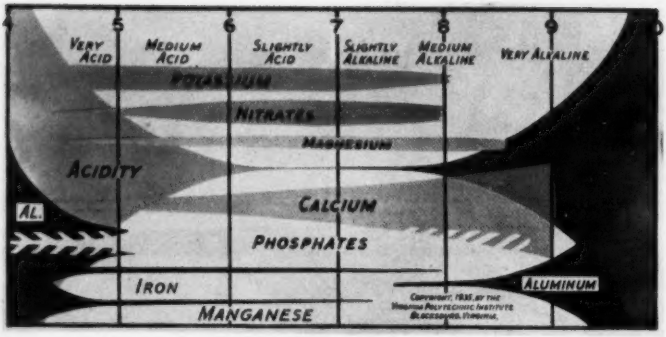

Chart 2

Here's how soil acidity affects plant food availability. Note that under strongly acid conditions, the phosphorus is tied up as iron and aluminum phosphates. Under very alkaline conditions, it is tied up as calcium phosphates. Courtesy of Virginia Polytechnic Institute, Blacksburg, Va.

early growth, the soybean derived less of the phosphorus from the fertilizer than did corn. At later growth stages the curves are similar.

There's no doubt about it, the young seedling must have an adequate supply of available phosphorus if it is to get off to a good start. Nevertheless, the peak demand period for this nutrient element comes, especially in grain crops, at the time the seed is being formed. To illustrate this point, let's look at the phosphorus uptake of corn as shown in chart 4. To get the data to draw this curve I increased the figures of W. J. Jones, Jr. and H. A. Huston, Indiana Agricultural Experiment Station, percentage wise to convert them to a 100-bushel-per-acre yield. The actual yield in their experiment was 76.3 bushels per acre. The corn was grown on a dark loam soil located on a second terrace above the Wabash River.

Plants starving for phosphorus exhibit tell-tale signs. Take corn for example. In young corn plants starved for phosphorus, the nitrogen and potash is usually high. The plant also accumulates sugars and when the sugar concentration becomes excessive, a red pigment, anthocyanin, also accumulates. The leaves turn a reddish purple. The oldest leaves are the first affected. This condition is most pronounced during periods of adverse weather when growth processes are slow. The reddening may disappear leaving no definite symptoms of phosphorus deficiency remaining except that the plant may have been stunted in growth.

APFC

(Continued from page 21)

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25 Years OF SOIL FERTILITY RESEARCH in California

By H. D. CHAPMAN
University of California Citrus Experiment Station, Riverside, California

An occasional review of progress serves several useful purposes. For those of us in research, who occasionally chafe at the seeming snail's pace of investigational work, it is heartening to take stock, for even a casual look at the past reveals substantial progress. Inventory also often reveals blind spots in our research; it serves also to underscore the interdependence and interrelationship of all the physical sciences and the increasingly important role of industry.

I have chosen to review certain aspects of soil research during the last 25 years because this coincides with the date when I came to California. At that time Dr. W. P. Kelley, with whom it was my good fortune to work for 10 years, was rounding out his extraordinarily productive investigations on the origin, nature, and reclamation of alkali soils, which studies led him into extensive research on base exchange, clay minerals, and soil chemistry generally. At that time, Kelley's research at Riverside (23, 24), and Hoagland's (21) at Berkeley, laid much of the groundwork and supplied a great deal of stimulation for subsequent research in the field of soils and plant nutrition in this state.

Time will not permit anything like a full review of the past 25 years of soil fertility research but I have organized this paper into a series of subjects to show some of the lines along which progress has been made.

Plant Food Elements Indispensable for Green Plants

In 1925 it was generally accepted that only 10 elements were indispensable for plant growth though a number of workers, notably the French investigators Bertrand (4) and Maze (28, 29) had suggested, from controlled experiments, that manganese, zinc, and boron, and certain other trace elements were essential for plants. Agulhon (1) in 1910, Miss Warington of Rothamsted in 1923 (40), and Somner (34), and Somner and Lipman (35) of California in 1926 obtained growth responses from boron, but it was the culmination of a series of field trials on deciduous fruit and nut trees and citrus initiated in 1928 by Chandler (7) of Berkeley, and aided and participated in by a considerable number of California farm advisors, by Hoagland and Hibbard (6), of the Division of Plant Nutrition at Berkeley, and by Parker (31), and myself and colleagues (10) at Riverside which finally established beyond question that zinc was an essential plant nutrient. Meanwhile, confirmatory evidence (30) (in some cases arrived at independently) from all over the world on zinc, and as well on boron, manganese, and copper, led students of this subject to conclude that the original list of 10 essential elements for plants must be expanded to include these four, and suggested that perhaps others would prove to be indispensable. This indeed proved to be the case and in 1939 Arnon and Stout (2), after a series of carefully conducted experiments, showed that molybdenum was essential for the tomato plant. This was confirmed for other plants by other workers. Piper of Australia (33) showed molybdenum essential for oats. Hoagland at Berkeley (20) showed molybdenum essential for myrobalan plum, and Vanselow and Datta (37) at Riverside showed molybdenum essential for citrus.

TABLE 1

Fertility Trend in an Irrigated Soil (Gain or loss of nutrients during fifteen years of cropping and fertilization with calcium nitrate)

	Pounds per acre
Calcium	+ 6,189
Magnesium	— 17
Potassium	— 3,552
Sodium	+ 1,913
Nitrogen	— 448
Phosphorus	— 227
Sulfur	+ 399
Chlorine	+ 119
Bicarbonate	+12,203

pH changed from 6.6 to 7.9

Fertility Needs of California Soils

Hand in hand with the aforementioned discoveries has been the substantial increase in our knowledge of the fertility of California soils. Nitrogen was the chief element in 1925, considered to be lacking in most California soils, and the belief widely held that, because most of our soils had developed under low rainfall conditions, their content of all the other nutrient elements was ample. Hilgard, in his extensive investigations and analyses of California soils, early called attention to their high calcium, magnesium, and potassium status. However, for some unknown reason his statement several times repeated that phosphorus was in general not materially higher than in soils of the humid region and that this element was likely to become limiting after a few years of cropping (18, 19) appears to have escaped the attention of subsequent investigators. In any case, no systematic attempt to appraise the phosphorus situation was made until in 1929 when I initiated a detailed study on southern California soils. The complete data of this study were not published (8) but a sum-

1 Paper delivered before 28th Annual meeting of California Fertilizer Assn.

mary of the work was presented before the California Fertilizer Association in Los Angeles, October 28, 1935, and later published in the California Citrograph, February and March, 1936 (9). Two classes of soils were found to respond under pot culture to phosphate: (1) a group of soils then mapped as old Valley filling or old marine soils, and (2) those containing free lime. These two classes, it was estimated, occupied 55 to 65 per cent of the arable soils of southern California. It is of interest that Jenny, Vlamis and Martin (22), as a result of more recent and more extensive pot culture trials on 430 California soils found 53.6 per cent of them to be low in available phosphorus.

In contrast to the behavior of field and truck crops, fruit and nut trees by and large have not responded to phosphorus. However, with the development of leaf analysis methods, Aldrich and Haas (3), and Coony and Aldrich (17) have uncovered both lemon and orange orchards which respond markedly to phosphate. A recent leaf analysis survey conducted by Forrest Fullmer and myself (12) has led us to conclude that roughly 10 per cent of the California citrus acreage may respond either in yield or fruit quality to phosphate fertilizer. The indications are that another 10 per cent may have been overfertilized with phosphate. In this connection our evidence, though still incomplete, indicates that zinc and iron deficiencies may be aggravated by too much phosphate and that nitrogen is made less effective.

Potassium.—Based on comparative soil analyses of humid and semiarid soils, Hilgard (19) repeatedly stated that California soils were richly endowed with potassium and that our soils would not need this element for many years. The present evidence, based on a large volume of work aided by grants from American Potast Institute, pot culture, field trials, use and development of tissue analysis techniques, shows that, in the main and for many plants, the supply of potassium in California soils is ample. However, on certain soils and with certain plants such as prunes, olives, and Ladino clover, potasssium fertilization is necessary.

Fruit size of citrus can be somewhat increased (11, 33) if the potassium content of the tree is on the low side. A leaf analysis survey of some 600 orange orchards in California (12) has shown very few with potash low enough to give yield responses, but a substantial percentage where size may be somewhat increased if potassium can be substantially increased in the tree.

Magnesium.—California soils are pretty well supplied with this element but definite deficiency symptoms have been found on orange trees. This has been traced in many orchards to an over-abundance of potassium. We have definitely produced magnesium deficiency symptoms on orange trees where considerable potassium sulfate has been applied to the soil. This same observation has been made by other investigators on a wide variety of crops. As will be pointed out later, it appears that in time magnesium

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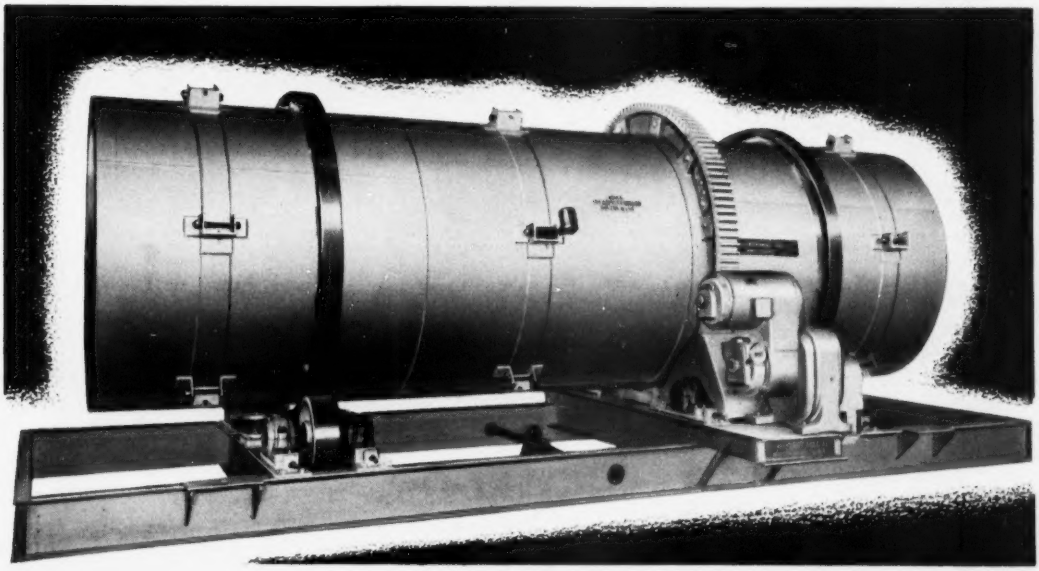

may become more limiting than at present.

Calcium.—California soils in the main are abundantly supplied with this element from a plant nutritional point of view but one soil type has been uncovered by Vlamis and Jenny (39), a serpentine-derived type where calcium is lacking. It should be pointed out in this connection, however, that soil permeability which has in many instances become injured due to sodium accumulation, has been greatly improved by the use of gypsum. This compound and also sulfur, which mobilizes calcium in the soil, is being widely used on California soils to restore impaired permeability.

Sulfur.—Since 1925, a considerable number of dry-farmed soils have been found in California which are lacking in sulfur. Conrad (16) of Davis has been responsible for this discovery and grain fields in certain areas have been markedly improved by the use of sulfur.

Thus, since 1925, a big change has occurred in the soil fertility status; soil deficiencies of phosphate, potash, magnesium, calcium, sulfur, zinc, boron, manganese, copper, and molybdenum have been discovered

Trend of Fertility in California Soils

Some rather interesting data have recently been published (5) on the trend of fertility change in our irrigated soils. This data was derived from a lysimeter experiment which I have been in charge of since the experiment was begun 18 years ago. The gain or loss of each of the major nutrients is shown in Table 1. The annual harvested crop in this experiment was, for the first 6 years barley, and subsequently Sudan grass. In the particular lysimeter from which these data are drawn, a mustard cover crop was grown in the winter and turned under, and fertilization was with calcium nitrate at the rate of 200 pounds N per year. The data show that the soil has gained substantially in calcium and sodium bicarbonate. This is reflected in the pH change, which in 15 years increased from pH 6.6 to 7.9. There were small increases in sulfate and chloride. The largest decrease or loss was in potassium, amounting to 3,552 pounds K in 15 years, or better than 200 pounds per year. Although this total decrease amounts to but 1 per cent of the total in the soil, it indicates that sooner or later potassium fertilization will be widely needed. There was also a net loss in phosphorus, a small loss in magnesium, and a substantial loss in nitrogen. In the case of nitrogen, this was despite the fact that nitrogen had been added annually at the rate of 200 pounds per acre.

Generalizing broadly from these data, it appears that **under irrigation agriculture,** the macroelements which sooner or later will become deficient are phosphorus, potassium, magnesium, and nitrogen. As already indicated, widespread deficiencies of nitrogen and phosphorus occur and in due course it can be expected that increasing areas will need supplemental potash. We need also to be on the lookout for magnesium deficiency. While the minor elements were not included in this study, it is certain that zinc, manganese, and copper will become increasingly deficient. With boron, the situation in irrigated soils will depend upon content of the irrigation water and the native boron content of the soil.

Progress in Development of Diagnostic Methods

The outstanding development in the field of soil fertility diagnosis during the past 25 years has been the enormous increase of our knowledge of the visual symptoms associated with deficiency and excesses of nutrient elements and tissue analysis. Lilleland (26), working with peaches and other stone fruits, Ulrich (37), working with sugar beets, and Chapman and colleagues (13, 14, 15), working with citrus, have contributed substantially to this field. We now have for citrus a fairly complete picture of the symptomology associated with deficiencies of each of the necessary plant food elements and a very considerable amount of data on the effects of excesses of various nutrient elements. In addition, we have worked out tentative leaf analysis stand-

(Continued on page 48)

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5. The installation of this system does not, in any way, disturb existing mixing facilities.

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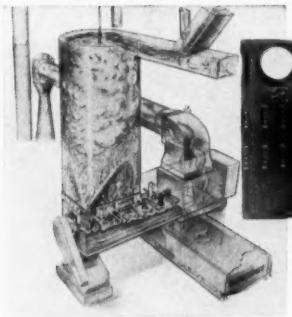


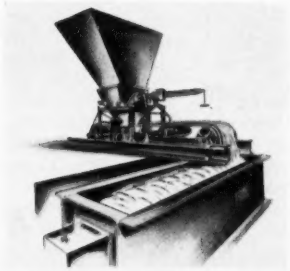
Central control panel shown above is nerve center of Super-Flo Process. Plant is operated from this point by one man.

SACKETT *Super-Flo*... A CONTINUOUS SUPERPHOSPHATE MANUFACTURING PROCESS

This new Sackett-conceived and developed process produces a superphosphate of premium quality in either powdered or granular form. Its complete mechanization and centralized panel control brings to the industry entirely new conceptions of high production speeds, low manufacturing costs and quality product control.

These Sackett patented processes are built in three sizes, 25 tons to 75 tons per hour.

Exclusive suspended acidulation produces highly converted superphosphate of excellent quality.



SACKETT CONTINUOUS AMMONIATING SYSTEM

The patented Sackett Continuous Ammoniation System is now being offered in four sizes with capacities ranging from 25 tons per hour to 100 tons per hour. This highly efficient method of ammoniating superphosphates and mixed goods with solutions offers many important advantages and is easily installed in connection with existing basing equipment. Higher ammoniation rates are made possible by its accurate proportioning of solids and solutions and lower reactive temperatures due to its exclusive aerating action which takes place during ammoniation. This system is also built in pressurized design for anhydrous ammonia or solutions having high vapor pressures.

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ALABAMA

Purity Fertilizer plant at Greenville, closed during World War II because of material shortages, has been purchased by **Julian Maddox** of Luverne, enlarged to increase capacity 900% and put back into production.

ARKANSAS

Forest City needs a fertilizer plant, according to the Young Business Men's Club of that city, before which a member stated that many local farmers are transporting fertilizer from as far away as Little Rock.

FLORIDA

Swift & Co. expect to complete by next month the addition to their Winter Haven plant, according to Manager **J. W. Whitaker.** The plant produces fertilizers and pesticides.

* * *

"Fertilizer Row", Homestead, can now breathe easier. The seven fertilizer concerns there have set up funds to pay a night watchman, who is under the jurisdiction of the local police department. His name is **Woolums.**

* * *

Soil Builders, Dunellon and the **Kellogg Co.,** Ocala were high bidders for 90 acres of phosphate land in Citrus County, near Inverness. **Howard Fertilizer,** Orlando, was high bidder for a 20 acre tract near Brooksville. Both areas were offered for lease by the Bureau of Land Management, Washington, D. C.

* * *

City Manager McCall, Plant City is running field tests on the dried sludge from the community sewage disposal plant before offering it for sale. If the local cemetery blooms under the test, the City may keep the product at home.

* * *

Glades Chemical Co., formerly **Stuckey Fertilizer Works.** Pahokee, has broadened its field to include pesticides, according to announcement by President **Blake Dunson.** **Q. P. Hudson** joined them as plant manager April 1. The motto of the company is "To make the good earth better is our business."

ILLINOIS

Farmers Liquid Nitrogen Company, Centralia, expected to be in operation May 1, using railroad tank cars for storage until their three 30,000 gallon tanks are in service. The $100,000 business is headed by **James D. Wrape,** president; **Robert S. Reeves,** vice-president; **Vernon Riechman,** secretary-treasurer.

* * *

Safeway Fertilizer Co., Decatur, also expects to be in operation this month, wholesaling and applying anhydrous ammonia. **Hunter Moody,** who also founded the **Safeway Crop Dusting Corp.** has changed its name to **Safeway Mfg. Co.** because emphasis now is on manufacture of tractor sprayers, of which more than 5000 annually are produced. The fertilizer operation will have two stations,—one near the **Decatur Aviation Co.** airport, another Moody project, the other in Dalton City.

INDIANA

Indiana Farm Bureau Cooperative has begun construction of a new $425,000 fertilizer plant near Columbia City, and expect to complete construction by early Fall if steel deliveries permit. The plant is expected to ship 50-60,000 tons annually, and will have storage capacity for 10,000 tons. On a 12-acre site, located on a railroad and a main highway, the plant will be 180 by 214 feet. **A. R. Mullin,** manager of the fertilizer and field seed department of the cooperative, is in charge.

LOUISIANA

American Cyanamid is reported to have agreed to purchase a large tract of land near New Orleans for the construction of a $47,000,000 nitrogen plant, for which they received certification last November from DPA. The site is known as the Johness Plantation and is in Jefferson Parish, about 8 miles above the Mississippi River bridge.

Sid Richardson Gasoline Company, New Orleans, are contemplating the construction of a $19,000,000 ammonia plant at Pointe-a-la-Hache, and has DPA approval for the project with a five year write off of 45%. Richardson and Bass natural gas holdings at Point-a-la-Hache and Cox Bay will supply the basic raw material. No contractor has been selected. Meanwhile two gas pressure booster stations, costing $1,500,000 are being built.

MISSISSIPPI

A multi-million dollar ammonia phosphate plant, using no sulphur, will be built at Pascagoula if DPA agrees. **M. T. Reed Construction Co.,** Belzoni, headed by **Maurice Deed,** filed the DPA application.

* * *

Mississipi Chemical, Yazoo City, has received a certificate of necessity, allocation of materials, for another 120 daily ton ammonia plant. to double their present capacity, **Charles S. Whittington,** president, announces. Executive vice-president **Owen Cooper** called a meeting of farmers last month, especially inviting "all those interested in obtaining an additional supply of nitrogen." The original plant was financed by an arrangement which permitted a fixed delivery of ammonia nitrate for each share of stock.

* * *

Dixie Liquid Fertilizer Co., Monroe, is now dealer in that area for the **KBH Corporation,** Clarksdale.

MISSOURI

Thurston Chemical Co., Joplin, has acquired its fourth fertilizer plant, according to **William R. Thurston,** president. They have a long lease on a plant in Trenton, made with **Fred Payne** of that city who is constructing a new building according to Thurston specifications. Designed specifically as a modern, fully equipped fertilizer plant, Thurston will have it in operation by July. It will have a capacity of 25,000 annual tons, bringing to 275,000 the annual Thurston tonnage from plants in Joplin; Tulsa, Oklahoma; Lawrence, Kansas.

Around the Map

Consumers Cooperative, Kansas City, have DPA authorization for the $16,000,000 nitrogen fertilizer plant to be built at Lawrence, Kansas.

NEW JERSEY

Wilson Organic Chemicals, Inc., Sayreville, are in production with a soil conditioner of the polyacrylate type called **"Poly-Ack".** This is the first farm chemical to be produced by the young (1947) concern headed by **Robert and James Wilson,** although both worked with farm chemicals when they were with **Dow.** They price it at $18 per gallon, sufficient to treat 1,000 square feet of soil.

NEW YORK

National Gypsum, Buffalo, expects 1952 to top 1951's record figure of $95,000,000 according to **Melvin H. Baker,** chairman at the annual meeting. Stockholders approved a new double capitalization of 500,000 shares and a restricted stock option plan for executives. There is no immediate plan to issue any of the added 2,500,000 shares. "It puts the company in a more flexible position" said Mr. Baker "for expansion through acquiring other companies by an exchange of stock. Too, if cash is required, we will be in a position to sell shares in a favorable market."

OKLAHOMA

Pay-Crop Fertilizer Co., has been chartered with capital stock of $100,000 by **L. E. Cox, J. M. Griffin** and **C. C. Crawford.**

* * *

Farmers Coop, Stillwater, will distribute in that section the fertilizer materials to be produced in the $16,000,000 plant to be erected by **Consumers Cooperative Association** at Lawrence, **Kansas.**

TEXAS

Texas City Chemicals plant at Texas City, which includes **Chemico's** flow scheme for the use of spent sulphuric acid, and which is expected to produce 70,000 annual tons, should be in production by next month, according to late word. Ground was broken March 8.

* * *

Hi-Yield Fertilizer Co., Bonham, are sponsoring a cooperative corn demonstration in Fannin County, six to eight farmers planting 15 to 20 acres each, with the Company supplying fertilizer at planting time, and nitrate for side dressing later.

A check plot will determine the farmer's base yield. If there is no yield increase, there will be no charge for the fertilizer and nitrate. From any increase the cost of fertilization will be deducted from the extra yield, and the remaining profits will be shared equally by the farmer and the Company. **Ike Morrison,** agricultural agent for Hi-Yield, announced the **plan.**

WASHINGTON

W. Brotherton Seed Co., Ellensburg, are establishing a liquid fertilizer mixing operation, using phosphoric acid from **Anaconda** and ammonium nitrate from **Dupont.**

AFRICA

Societe Cherifienne d'Engrais et de Produits Chemiques, Morocco, has increased by 25% its superphosphate production, 1951 over 1950, turning out 84,720 tons. They made 16,362 tons of sulphuric acid from sulphur, and 16,336 tons from pyrites.

* * *

African Explosives and Chemical Industries, Modderfontein, is on schedule with its new plant which will produce 33,000 annual tons of ammonia. The plant is a $12,000,000 operation.

AUSTRALIA

Cresco Fertilisers Ltd. will be the first plant in Australia to be completely converted to pyrites production of superphosphate. The Government has given a priority equal to the defense priority to all materials needed by superphosphate producers to make such conversions, aiming to convert all plants to pyrites production within the next two years.

* * *

New Zealand farmers are hailing molybdenum as a "wonder tonic" for their soil. **Invermay Research Station** reports as much as 100% increased pasture growth when two and a half ounces per acre are applied.

CANADA

American Cyanamid has set up **Chemical Construction (Inter-American) Ltd.** with Toronto as headquarters, which will handle chemical plant design and construction projects not only in Canada, but in Central and South America as well. **Chemico** will continue to serve the United States and the remainder of the world.

* * *

Consolidated Mining & Smelting Co. of Canada has experienced demand in 1951 to justify an increase in plant capacity of 70,000 annual tons, which is going forward.

INDIA

Sulphur sources considered promising have been located at Amjhor, Karwar, Chitaldrug, Polur, Wynaad. The Geological Survey is making thorough checks of the potentials.

In the Field of

ALLIED FARM CHEMICALS

200 ATTEND NAC CONVENTION

More than 250 persons attended the Spring Meeting of the National Agricultural Chemicals Association, held April 6-9 in San Francisco. The meeting revolved around the theme of The Fifth Plate as featured in our "It Seems to Me" column last month . . . the need to be ready to feed the rapidly increasing World population . . . and what the pesticides industry can do about it.

While those present were fewer than came to the Spring Lake meetings last Fall, the meetings were well attended. The delegates were welcomed by W. E. Ball, Stauffer Chemical Co., president of the Western Agricultural Chemicals Association.

In his annual report, president Arthur W. Mohr told of the tremendous increases in food and fiber crop production brought about by the use of pesticides, and stressed the need for pest control in these days of need for maximum production.

He extended special thanks to William Allstetter now vice-president of NFA, but who, in his former role in USDA has been of great aid in stimulating early buying of pesticides.

Mr. Allstetter spoke on the four Federal agencies which affect the production or disposition of pesticides. DPA, which has over all policy jurisdiction; NPA, which executes general DPA directives; Office of International Trade, which is claimant for export pesticides; USDA, which is claimant for domestic pesticides.

He spoke also of the relationship of tax amortization certificates, and said they would be increased only as expansion goals had been set up and were unsatisfied, as is the case, for example, with sulphur. It will be increasingly difficult, he thinks, to obtain TA's in the future.

Joseph B. Cary of Food Machinery & Chemical Corp said the licensing of new pesticides is going to be increasingly difficult, because the Government is insisting on more and more complete and comprehensive toxicity data, which involves, usually, years of testing.

Dr. G. F. MacLeod, Sunland Industries, gave a lengthy criticism of the statistical data collected by Federal agencies.

A steamer tour on San Francisco bay occupied the afternoon.

Tuesday morning was devoted to a closed session, presided over by executive secretary L. S. Hitchner, with golf in the afternoon and a banquet, and speeches, that night.

Wednesday morning Dr. Stanley B. Freeborn, U of California assistant dean, spoke on the nip and tuck battle which is waged to keep the food production program from being defeated. The achievements of agriculture during the past 10 years have been due to mechanization, fertilization and chemicalization.

Dr. W. C. Jacobsen, assistant director California Dept. of Agriculture, reviewed the history of California regulations. Dr. A. M. Boyce, U of Cal. Citrus AES director, just back from a trip around the world, gave highlights of agriculture on various continents.

USDA REPORT ON PESTICIDE NEEDS

Here is the full text of the USDA report on pesticides, which was briefed in our April issue because it came out just as that issue was going to press:

Farmers' total requirements for all pesticides during the 1951-52 crop year are estimated to be about 9 percent higher than for 1950-51, on the basis of a Nation-wide survey conducted by the U. S. Department of Agriculture. Pesticides are the chemicals or chemical mixtures which are used by farmers as insecticides, fungicides, and herbicides (weed killers). Certain other chemicals, used as defoliants for cotton and other crops, also are included.

The study of the quantity of pesticides estimated to have been used in 1950-51 and to be required for 1951-52, was made under the sponsorship of the Production and Marketing Administration State Committees and Insular Area Offices by special technical advisory committees of specialists from the State land grant colleges, State experiment stations and extension services, representatives from other USDA agencies, and other competent persons in each State. Representatives of the pesticide industry were consulted in many states.

The survey covered 54 chemicals to determine the quantity of each estimated to have been used as pesticides during the crop year 1950-51 and estimated to be required for 1951-52. Data developed from this study and other sources will be used by the Department as a basis for supporting its claims to be defense agencies for the pesticides and miscellaneous chemicals required for agricultural production.

The higher production goals which farmers have been requested to attain this year does not mean that the use of all pesticides will increase in the same proportion. The necessity for conserving certain basic materials, such as copper and sulfur, which are in short supply, is reflected in the generally lower estimated requirements for pesticides containing these materials. The requirements for pesticides which have been used for a

relatively long period remain rather stable, while those for newer crop protectors continue to increase. For example, requirements for the synthetic chlorinated insecticides, such as benzene hexachloride, DDT, aldrin, and toxaphene, and for the synthetic organic herbicides, such as 2,4-D and 2,4,5-T, are expected to be up an average of 25 percent this crop year as compared to the 1950-51 crop year.

Benzene hexachloride (12% gamma basis) consumption in 1950-51 was 80,000,000 pounds. During the current crop year, requirements are expected to increase to 95,000,000 pounds.

DDT requirements this year are estimated at 85,000,000 pounds as compared with 78,000,000 pounds used last year.

Calcium arsenate requirements, the use of which fluctuates with the amount of cotton boll weevil infestation, is expected to be 45,000,000 pounds this year as compared with 39,276,000 pounds used in 1950-51.

Lead arsenate requirements are estimated at 30,000,000 pounds this year, down somewhat from the 31,509,000 pounds used last year. It is pointed out, however, that at the time the estimates were being made, lead was in actual short supply.

Parathion requirements this year are estimated at 7,000,000 pounds, compared with the 4,670,000 pounds of this chemical used last year.

Use of aldrin chlordane, dieldrin, and toxaphene is expected to reach 91,500,000 pounds during the 1951-52 crop year, an increase of 29 percent over 1950-51 usage.

Estimated requirements for rotenone insecticides are about the same as those of last year, indicating that the average quantity of slightly more than 7,000,000 pounds of rotenone-bearing roots which has been imported during each of the past four calendar years should be adequate for present needs for the material.

Requirements for cryolite this year are estimated at 3,000,000 pounds. Because it also is used in aluminum production, available supplies of this chemical may not completely meet requirements. Ryania, an alternate pesticide in one of the principal uses of croylite, will be available, however.

Among the weed killers, requirements for 2,4-D are expected to reach 28,000,000 pounds this year as compared with 23,494,000 pounds used last year, while estimated requirements for 2,4,5-T, a much newer type weed killer, are 6,000,000 pounds this crop year as compared with 2,822,000 pounds used last year.

The quantity of liquid grain fumigants used during 1951, according to estimates developed by the survey, was 2,674,050 gallons. Requirements for 1952 are estimated to be 110 percent of that quantity.

With demand growing, about 20,000,000 pounds of dithiocarbamate fungicides are expected to be required this year for use against fungus diseases on fruit and vegetables, and for seed treatments. This

is an increase of about 16 percent over last year. In case of more severe shortages of copper or sulfur fungicides further increase in this estimate is expected.

Combined agricultural requirements for phenothiazine and sodium fluoride are estimated at over 5,000,000 pounds this year, slightly above last year. Although use of these chemicals as insecticides has been largely displaced by other materials, they still are important for use as vermifuges for livestock.

A breakdown of total estimated requirements of major pesticides for 1951-52, expressed in percentages of 1950-51 estimated use, follows:

INSECTICIDES	Percent
Aldrin	109
Aramite	178
Benzene Hexachloride	114
Calcium arsenate	112
Chlordane	105
Chlorinated propane derivatives	158
DDT	107
DDD (TDE)	116
Dieldrin	344
EPN	133
Ethylene dibromide	120
Ethylene dichloride	100
Liquid grain fumigants	110
Lead arsenate	99
Methoxychlor	122
Nicotine Sulfate	97
Paradichlorobenzene	96
Parathion	125
Pyrethrum	107
Rotenone	106
TEPP	104
Toxaphene	130

FUNGICIDES	Percent
Copper compounds	101
Dithiocarbamates	116
Lime-sulfur, dry	76
Lime-sulfur, liquid	93
Organic mercurials	116
Pentachlorophenol	106
Sulfur (conditioned)	108

HERBICIDES AND DEFOLIANTS	Percent
Ammonium sulfamate	104
Borax	118
Calcium cyanamide	129
2, 4-D	113
Dinitro compounds	130
IPC	131
Potassium cyanate	131
Sodium Chlorate	108
Sodium cyanamide mono	151
TCA	125
2, 4, 5-T	153

MISCELLANEOUS	Percent
Phenothiazine	112
Sodium Fluoride	106

The estimated requirements for each pesticide, as determined from the survey, is a statement of the quantity needed to provide protection under conditions at least as severe as were encountered during the recent history of the particular pesticide, although this does not mean that this quantity will actually be available in every case.

The estimated requirements are based on an evaluation of the farmers' plans and preferences made by persons in the several States familiar with the local needs for pesticides. However, the occurrence of pests cannot be predicted with any degree of certainty. Slight changes in the weather or other conditions could intensify the need for pesticides in many areas.

Farmers should, therefore, be alert throughout the year to changing conditions which may affect their needs for pesticides, and they should continue to follow good cultural practices which reduce the need to control pests. Farmers also can help prevent distribution bottlenecks during the periods when pesticides will be needed by buying at least part of their anticipated needs in advance.

A table based on the survey, showing regional trends in the estimated quantities of individual pesticides required this year as compared with use last lear, is available upon request to the Office of Information Services, Production and Marketing Administration: U. S. Department of Agriculture, Washington 25, D. C.

DPA GOALS FOR THREE INSECTICIDES

Expansion goals for three organic insecticides . . . Lindane, Benzene Hexachloride-Technical Grade, and DDT . . . were announced by Ralph S. Trigg, Deputy Administrator for Program and Requirements.

The goal for Lindane calls for an annual capacity of 5,120,000 pounds, gamma isomer content, by January 1, 1955. In 1951 production of this chemical was very small, and there was only one producer. The proposed expansion goal will apply only to those facilities required for extraction of 99 percent or more gamma isomer from Benzene Hexachloride, technical grade. This will require an expansion of 850,000 pounds capacity beyond that covered by the applications for certificates of necessity thus far received.

In a separate determination, DPA found that the capacity to produce Benzene Hexachloride, technical grade, had by January 1, 1951 reached 17,437,000 pounds (of 100 percent gamma basis), and that further unaided expansion would bring capacity to 23,700,000 pounds by 1955, a capacity sufficient to satisfy requirements.

DPA set a production goal for DDT of 155,000,000 pounds (100 percent basis) by January 1, 1955. This goal is 53,000,000 pounds above the January 1, 1951 capacity of 102,000,000 pounds. About 27,000,000 pounds of capacity resulted from unassisted expansion during 1951. Minor additions and improved operating efficiencies during that year accounted for another increase of 7,600,000 pounds in the output of existing facilities.

It is expected that 16,000,000 pounds additional will come through expansion in 1952 and that the remaining required 2,400,000 pounds will be provided by further unassisted minor additions and improvements to existing facilities.

Holton Joins Hayes-Sammons

The rapid growth of the agricultural industry has caused Hayes-Sammons Chemical Co., Mission, Texas to expand its laboratory facilities and hire a full time chemist, Harry Holton, who is supervising the modernization of a laboratory in Mission, in which he will spend most of his time working with liquid concentrates and dusts. He has been with a veterinary pharmaceutical and insecticide firm.

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OKLAHOMA CITY • PORTLAND, ORE. • REIDSVILLE, N. C. • HARLINGEN, TEXAS • CHAGRIN FALLS, O. • WORCESTER, MASS. • CROSSETT, ARK. • SAN FRANCISCO

Mostly Personal

William R. Thurston, president of **Thurston Chemical Company,** Joplin, Missouri has been made a director of the U. S. Chamber of Commerce, representing Missouri, Oklahoma, Kansas, Arkansas, Texas and Louisiana, for a period of two years.

* * *

James R. Turner, has been made assistant agronomist with **Pacific Coast Borax,** specializing on fertilization of alfalfa and pastures in Tennessee and Kentucky.

* * *

O. D. Crosby, superintendent of **TVA's** phosphate section at Wilson Dam since 1934 has been made works manager for the new $3,000,000 di-calcium phosphate plant now under construction near Columbia, Tennessee, by **Shea Chemical Co. J. M. Perry,** plant superintendent, has been made general foreman of the **Virginia-Carolina** nodulizing plant at Mount Pleasant.

* * *

L. H. Hiller, for 20 years with the **Swift & Co.** plant food division at Norfolk, has moved to New Orleans from where he will be manager of credits for their New Orleans, Shreveport and Houston divisions. **A. H. Phillips** has replaced him in Norfolk.

* * *

Thomas C. Law, industrial chemist and past imperial potentate of the Shrine, head of **Law & Co.** Atlanta, Georgia, has left for a tour of U. S. Naval installations in the Pacific, flying down in a Navy plane and coming back some time this month via warship. Law & Co. has been in business for 50 years.

* * *

R. G. Bullock has returned to **Chase Bag Company** duties and has been made manager of their Cleveland office, after a year as head of **NPA's** textile container branch, and as deputy chief of the Metal, Wood and Textile Packaging Division. He says "I was very much impressed by the caliber of people provided by industry in NPA and the competent government personnel with whom they work."

* * *

G. W. Huldrum, Jr. has been made sales manager of the Western division of **Shell Chemical.** He has been with them since 1939.

* * *

Henry E. Craven, Jr. has been made manager of the newly organized Lake Charles, Louisiana, division of **Davison Chemical,** which will operate the new plant the company is building there.

* * *

James W. Taylor who has been assistant district manager for **St. Regis Paper** in the Southeast, is now in charge of bag sales for **Kraft Bag Corp., Gilman Paper** subsidiary, operating two completely integrated bag plants in Gilman, Vermont and St. Marys, Georgia. **B. T. Miller** who formerly covered the middle West for Kraft Bag has been moved to the South, covering Alabama, Mississippi, Louisiana, southwest Tennessee, Arkansas and Texas.

* * *

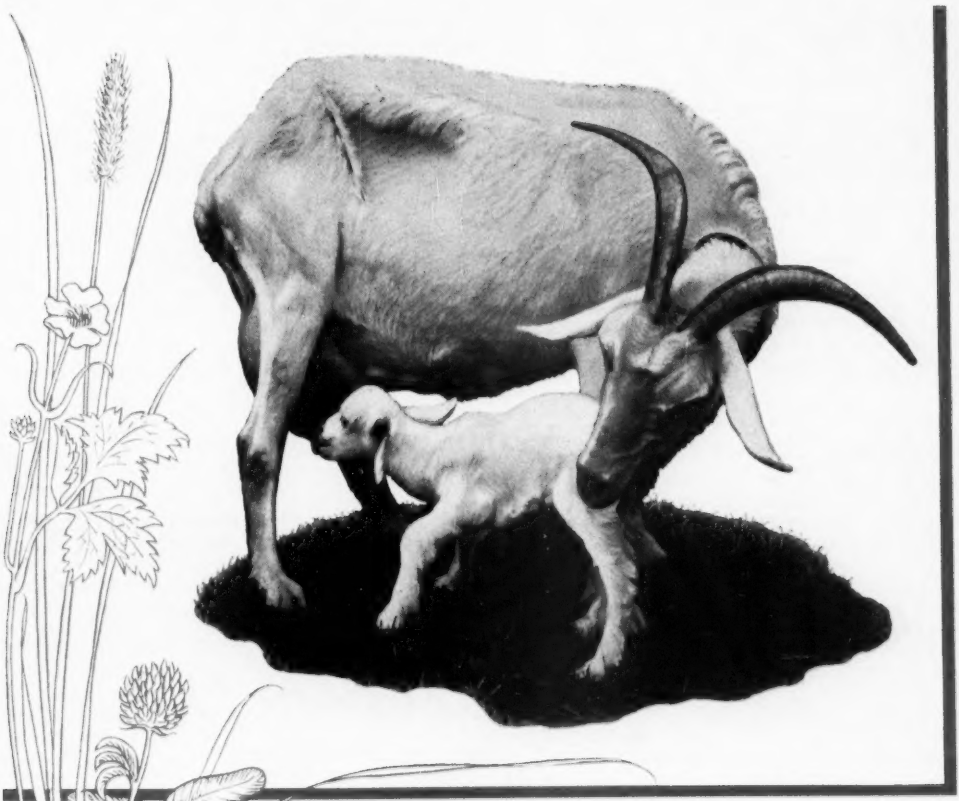
Abbott K. Hamilton, vice president of **Commercial Solvents,** is now in charge of Product Divisions. He came with them in 1946 when they bought **Pennsylvania Alcohol & Chemical** of which he was vice-president. **Orlando J. Alvarez** is Ex-

Left, W. S. North president and general manager, and right A. M. Sheldon, board chairman of Union Special Machine Company, Chicago. Mr. North is grandson of the founder. Mr. Sheldon joined them in 1915.

William B. Copeland, Smith-Douglass vice-president, who has been in charge of mid-West operations and will now return to the home office, participating in general administration.

John M. Wallach, for a number of years in the chartering field, who has joined H. J. Baker & Bro., leaving Chilean Nitrate Sales Corp. where he was assistant traffic manager.

William J. Exum, who has been appointed by the Barrett Division to head sales of direct application liquid nitrogen materials, from the New York office.



A WHOLE FARM THRIVES ON NOURISHMENT

Animal or vegetable . . . each and every living organism on the face of our earth grows 24 hours a day. Nowhere is this so evident as on a farm . . . for a farm's very purpose is to foster a collection of growing creatures and plant life.

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port Division regional manager for Central America and the Carribean area. **Robert E. Hays** is district sales manager for the Agricultural Chemicals Division, with headquarters at Jackson, Mississippi. **Fricis Danga,** a microbiologist recently come to the U.S. from Sweden, has joined the Research Division.

* * *

Fred W. Fraley, vice-president of **Diamond Alkali,** and **Dr. George E. Holbrook** of **Dupont** have been made deputy directors of NPA's chemical division under the rotation plan, replacing **Frederic Arden,** former assistant director of the division, who has returned to **Mathieson Chemicals.**

Chase Bag Managers Meet

Managers and Sales Managers from Chase Bag Company's twenty-nine factories and sales offices convened in Chicago in the annual three-day Management Conference. R. N. Conners vice-president and general sales manager, conducted discussions about various production and sales phases of the 105-year old firm and the current trend of packaging.

Meili-Blumberg Acquires Hough Sweeper Business

The Meili-Blumberg Corporation of New Holstein, Wisconsin, has just completed negotiations with The Frank G. Hough Co. for the acquisition of its line of tractor sweepers. Meili-Blumberg will now distribute as well as continue the manufacture of all such sweepers under the M-B trademark. Their 25 years of experience in manufacturing these sweepers together with the closer dealer connection should result in a more active sales and service organization and further improve public acceptance of the M-B Sweepers.

Engineering improvements and an expansion in plant facilities are now under way. No changes in the former distribution set-up are contemplated.

Mente & Co. Cocktail Party

A cocktail party sponsored by Mente & Co., Inc., New Orleans bag manufacturers, will be a feature of the Sixth Joint Annual Convention of the Georgia Cottonseed Crushers Association and the Alabama-Florida Cottonseed Products Association to be held in Savannah, Georgia, June 2-3, 1952, at the General Oglethorpe Hotel. Hosts will be O. F. Littlefield, Manager of the Savannah branch of Mente & Co., Inc., assisted by Jim Baggs, Jr., Nelson Thatch and Herb Henry of the Mente staff.

Kraft Bag Sampling

A full size sample bag is being mailed to bag users by Kraft Bag Corporation, to show them the points of their new development, a special insert multiwall shipping sack, primarily intended for fertilizer and chemical products. The company sets forth these advantages: better valve closure, reduces sifting, is less expensive.

SCOCO PLANT FEATURES D-K MIXING

The new Southern Cotton Oil plant at Cartersville, Georgia, was built with modern conditions and the need for labor economics fully in mind. It consists of a raw materials and machinery building of fabricated steel which was furnished by Muscogee Iron Works, and a warehouse which was erected by Luria Engineering Corp. Davidson-Kennedy of Atlanta were responsible for the mixing machinery and overall installations.

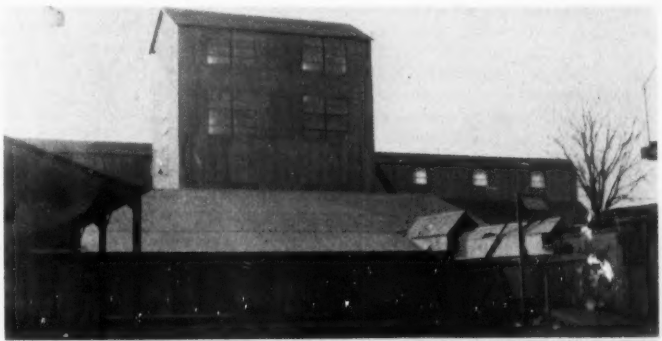
This consists of a 9-bin D-K cluster hopper, a 2-ton Ransome mixer, a D-K shaker screen, plus auxiliary equipment. In connection with the cluster hopper, one of D-K's new, patented automatic nitrogen solution tanks was installed, with air-controlled mixer intake and discharge for accurate one-man operation.

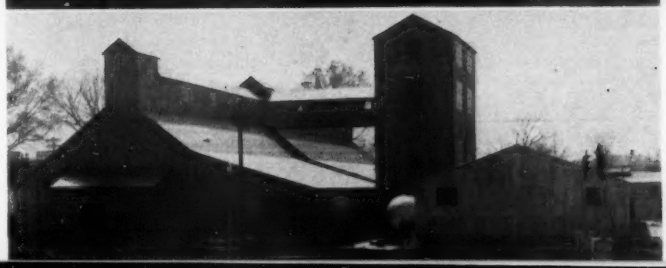
Commercial Fertilizer reported in some detail on this new tank in our February issue. It measures by weight, instead of by volume, thus avoiding inaccuracies caused by changes in density when temperatures change.

Sam McGowan, Scoco's Cartersville manager says "I am well pleased with the installation. In fact, I have been able to account for bulk material and solution going into finished goods to within 1% of actual weight. This arrangement of weighing and measuring bulk goods and solution into mixed goods has proven to be very satisfactory."

Through the use of 2 Hough Payloaders, and one materials man on top of the hopper system, the installation has reduced the labor force in the mixing operation to a total of only four men. Another man-power saving has been effected in bagging by the use of two Exact Weight bagging scales, a Union Special bag closing machine and conveyor, together with a belt conveyor from closing machine to truck loading.

Bag goods for storage in warehouse and box car loading has been palletized for additional saving in labor. And bulk material loading into spreader trucks is handled through a "Y" valve direct from the basing elevator.





Exterior of C. O. Smith Guano Company's plant one year after construction and application of Bitumastic to roofing and siding.

SMITH GUANO PLANT HAS BEEN REBUILT TO STAY

The plant of the Smith Guano Co., Moultrie, Georgia, has been rebuilt after the disastrous fire which destroyed their buildings, and one of the features of the new structure is the acid-fume resistant roof and walls, composed of galvanized roofing and siding, coated with Bitumastic, the well-known Koppers Company product.

The plant construction was well under way when it was decided to use this modern technique, and a conference was held as to procedure. The owners; the John J. Harte Co., project engineers; the Southern Lead Burning Company, Bitumastic distributors; and a representative of the Koppers Company all sat in.

The problem was one that will be obvious to any fertilizer manufacturer. The season was approaching and the plant needed at once. If the unguarded roof and siding were put on, acid fumes, the ancient enemy of the industry, would eat into the roof and walls, destroying the metal in about 18 months. So a mass production coating operation was set up, right on the yard of the plant.

Wooden racks were built and the galvanized sheets were wiped clean, and then primed with Bituplastic primer. After several hours drying time had elapsed, a top coat of Bituplastic #28 was applied to both sides, and the sheets were carried to the job and put into place as fast as they were ready. After one years service the plant remains in excellent condition.

Bituplastic #28 is a fire-retardant material, which will not support combustion, and was selected for this job for this quality because it will not check or crack in direct sun rays and its resistance to the corrosive atmosphere involved. Obviously a coating that checks or cracks would admit fumes to the metal, and serve poorly as a protector.

The Bituplastic #28 was applied with heavy duty spray equipment, which was brought to the job as a means of speeding up the work. The coating was rushed. The whole project was speeded up with all the facilities at the disposal of the Koppers Company and Southern Lead Burning.

The magnitude of the job may be visualized when the figures are examined. A total of some 100,000 square feet of galvanized material had to be covered, requiring 400 gallons of Bituplastic primer, and 3,000 gallons of the #28 Bituplastic top coating.

PYRITES

(Continued from page 25)

ing through the grating, even when for some reason or other the supply of blown air from under the grating should prove insufficient.

The pyrites to be roasted are introduced into the furnace at the level of the fluidified strata by ordinary hopper or rotating table type feeders, and some 50 to 60% leaves the furnace after combustion by an overflow provided on the lateral walls of the furnace whilst the remaining 40 to 50% is removed with the gas, which can, if desired, pass through a waste heat boiler for the recovery of the considerable heat developed, which gas is then rendered dust-free either in air separators or an electrostatic dust-precipitator.

The stratum of material in combustion is rendered fluid to such a point by the air blown in from under the grating as to be perfectly homogenous in temperature and in granulometrical composition etc. so that it behaves exactly as if it were a liquid.

Suitable arrangements are made to moderate the temperature of the strata of material in combustion and to avoid its becoming sintered. Among such means Door sometimes introduce the pyrites to be burnt into the furnace in the form of a sludge containing up to 20% of water which is suitably prepared by saturating the flotation pyrites with water, and pumped into the interior of the furnace.

These furnaces can burn pyrites with particles considerably larger than those used in flash roasters (up to 1.4 mm in the Door furnace; up to 6 mm in the Ludwigshafen furnace of the B.A.S.F. as compared with a maximum of 0.16 mm for flash roasters).

The capacity of these furnaces in terms of surface of the grating is extremely high, for example in the

Symbol for a new High Grade Muriate of Potash

CONTINUED progress has been made in the installation of modern equipment for mining and refining high grade muriate of potash at the new Southwest mine near Carlsbad, New Mexico. Production is scheduled to begin about August, 1952. Soon thereafter, the movement of HIGH-K Brand Muriate of Potash for agricultural purposes should start from Southwest.

Southwest Potash Corporation

HIGH-K Potash

* Trade Mark

61 BROADWAY ★ NEW YORK 6, N. Y.

Ludwigshafen furnace it is possible to burn up to 25 tons per sq. m. per day whilst with the Dorr furnace the capacity would be only 4 tons per sq. m. per day.

The consumption of electric current of the Ludwigshafen furnace runs about 10 to 12 kwh. per ton of pyrites roasted.

The sulphurous gas leaving the furnace has an SO_2 content of between 12 and 14%. 2.5 to 3% of O_2, 0.08% of SO_3 and a temperature of about 800° C.

This high concentration of SO_2 with a minimum of SO_3 assists the operation of dust removal and washing of the gas, and allows a recovery of steam at the rate of 2.3 to 2.5 Kg of steam per Kg. of sulphur burnt.

With these types of furnaces, the production of sulphurous gas from pyrites can be considered as not being very much more expensive that that obtained from crude sulphur, which must now be considered as becoming increasingly too valuable a raw material to be used in the production of sulphurous gas.

This short summary of types of furnace available for roasting pyrites has simply the object of giving rise to a discussion on this subject by the technicians taking part in the Congress. which subject we consider to be of particular interest at a time when many plants are being forced to replace their sulphur burners with pyrites furnaces.

SOIL RESEARCH

(Continued from page 34)

ards for all elements and while confirmatory data is needed, we are now in a position by means of visible symptoms plus leaf analysis to make fairly accurate appraisal of the status of citrus tree nutrition. Leaf analysis is especially valuable in distinguishing between one of two or more conditions where the symptomology is very similar. Thus, in the case of sulfur and nitrogen deficiency, the leaf color is the same but leaf analysis will definitely distinguish between them. If nitrogen is lacking, sulfur will be high and nitrogen low. If sulfur is lacking then N is high and S low. Another example is the similarity, respectively, of boron excess, sulfate excess, and molybdenum deficiency. Here again leaf analysis provides a ready means of distinguishing which is which.

A great deal can be learned from detailed soil examinations. In citrus orchards, root distribution and condition, nematode infestation, starch in roots, and histological sections at the bud union are important recently developed methods of considerable value.

Development of Research Tools

Advances in research is tied closely to the development of tools and in the last 25 years enormous progress has been made. I can only touch on a few items. Vanselow and Liebig's (38) research and development of the spectrograph as an analytical tool has been an outstanding achievement. As applied to citrus analysis, Vanselow and Liebig can now more or less simultaneously and quantitatively estimate with an

accuracy of 15 to 25 per cent the amounts of some 25 of the trace elements in plants. This same job 10 years ago would have required months, with a much less certain reliability. The flame photometer, based on the same principle as the spectrograph, is now being widely used for the accurate determination of sodium and potassium. Lilleland (27) and his colleagues at Davis, pioneered in the use of this instrument in California. It is now widely used by all of us.

Radioactive tracer elements about which so much has been written, represent other powerful tools developed within the last 25 years.

Many kinds of electronic measuring devices, such as pH meters and colorimeters, have been developed in the past 25 years.

Color photography and great improvements in photographic materials generally have proved of great value.

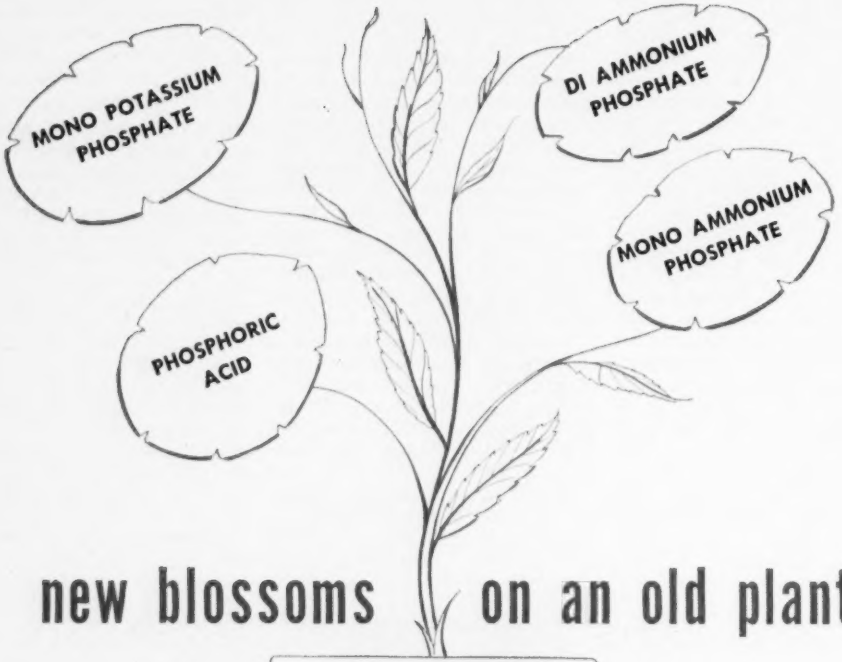
Increasing use is now being made of mathematical machines and computers.

Water and sand culture techniques have been greatly improved. I take some pride in having developed techniques for growing citrus trees indefinitely in water culture. We now have trees which have been growing continuously for 15 years in water culture. These trees regularly bear large crops of high quality fruit, and are healthy and vigorous. There is no reason to suppose they will be shorter lived grown in this medium than in soil.

Fertilizer Application Methods.—Progress has been made here also. Twenty-five years ago the commercial use of nutritional foliage sprays was practically unknown. Today it is commonly and widely used on many types of plants.

Distribution of fertilizers in irrigation water and the injection of ammonia gas into soils are further developments familiar to soils and industry people alike. In addition, there has been substantial progress in the development of specialized machinery for fertilizer application to particular crops.

Progress in Soil Fumigation.—Another significant development which has received great impetus during the past 10 years especially is the increasing use of soil fumigation to control soil-borne diseases and agricultural pests. The constant search by chemical industries to develop products useful to agriculture, has already led to important developments in this field and there is increasing promise for the future. The spreading infestation of our soils by nematodes, disease organisms of one kind or another, plant-destroying pests of several kinds, to say nothing of weeds, represents a great challenge and a great potential market for new chemicals. It is now common practice among some citrus



new blossoms on an old plant

MONSANTO
CHEMICALS — PLASTICS
Serving Industry . . . Which Serves Mankind

This is good news in agriculture and in industry. Increased availability of vital plant nutrients in the form of soluble inorganic salts for fertilizer solutions can mean new products and new markets for fertilizer manufacturers.

New emphasis is being placed upon WATER-SOLUBLE FERTILIZERS. Growers and manufacturers are developing new methods . . . new applications of high-analysis soluble plant foods which combine NITROGEN . . . PHOSPHORUS, POTASH and, in many cases, weed killers and insecticides, too.

MONSANTO, to help meet the increasing demands for plant foods, has increased quantities of four basic, soluble fertilizer chemicals . . . MONO AMMONIUM PHOSPHATE . . . DI AMMONIUM PHOSPHATE . . . MONO POTASSIUM PHOSPHATE . . . PHOSPHORIC ACID 75.0%.

New uses for WATER-SOLUBLE FERTILIZERS are proving profitable for growers . . . profitable for FERTILIZER MANUFACTURERS. Perhaps these products will fit into your production planning. Contact any District Sales Office, or write MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700-C South Second Street, St. Louis 4, Mo.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto Canada Limited, Montreal.

MONSANTO PLANT NUTRIENT CHEMICALS			
	N	P_2O_5	K_2O
Mono Potassium Phosphate (Crystals)	—0—	51.6%	34.2%
Di Ammonium Phosphate (Crystals)	21.0%	53.85%	—0—
Mono Ammonium Phosphate (Crystals)	12.2%	61.61%	—0—
Phosphoric Acid (75.0%) (Liquid)	—0—	54.5%	—0—

growers to fumigate their old citrus soils prior to replanting. I look for this practice to increase, and the net effect of present and future developments in this field so far as the fertilizer industry is concerned will be to increase the withdrawal of plant foods from the soil by virtue of increased yields. Thus greater tonnages of fertilizer will be required.

Organiculture and the Pollution Problem.—I shall only briefly mention this subject but some note should be made of the extent to which the organiculture myth has gripped certain segments of the population. The extravagant claims made by the organic matter enthusiasts and particularly their claims that we are poisoning our soils, our crops, and animals, and undermining human health with chemical fertilizers are without foundation and when the dust settles, reason, based on long-established science of soils and plant nutrition, will prevail.

The Future

The progress achieved in the past 25 years in the field of soil fertility has been great and has been, in part, responsible for the large increase in fertilizer tonnage now being sold to California farmers. In 1925, 85,933 tons of fertilizer and agricultural minerals were sold in California. In 1950, this had mounted to 1,036,301 tons. I look for this tonnage to increase in the future as a result of progress in the following fields:

1. Increasing development of and conservation in the use of irrigation water will somewhat increase the acreage devoted to irrigation agriculture in the next 10 to 25 years.

2. The use of modern land-clearing equipment, of subsoilers to break up hardpan, land leveling machinery, etc., will also bring new acres into production. This increased acreage will ultimately require fertilizer to take care of plant food removals by cropping, leaching, and erosion.

3. The wider application of soil conservation methods will increase both yields and acreage and thus increase fertilizer needs.

4. Reclamation of alkali areas and improved drainage will bring further averages into production.

5. Better yields through the use of soil fumigation and improved crops through selection and breeding will increase the drain on soil fertility and make for greater fertilizer consumption.

All of these and probably other unforeseen developments will create an increasing need for fertilizers and place a greater dependence on the fertilizer industry.

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WASHINGTON

(Continued from page 19)

Office of Price Stabilization announced April 16.

Agricultural liming materials, OPS explained, are, generally speaking, any materials that contain calcium alone or calcium and magnesium, in form and quantity sufficient to neutralize soil acidity, and which are sold for agricultural purposes.

Tailored Order Out On Bulk Superphosphate

Under the provisions of an OPS order issued April 22, manufacturers of normal, double and triple superphosphate will price their bulk output under CPR 137, effective April 26, instead of GCPR or CPR 22.

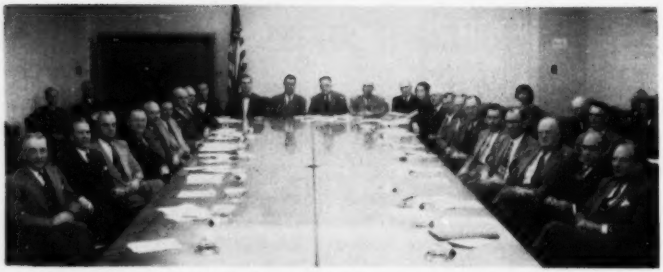
Ceilings are set on the basis of available phosphoric acid (APA) content, and super phosphates are divided arbitrarily into three classes —21% or less; 22 to 39%; 40% or more . . . normal, double and triple in other words. Ceilings are established for the first and third classes, but makers of double must apply for specific ceilings of their own.

Exceptions are also made for unusual situations, such as that in the Rocky Mountain and Pacific Coast areas, in consideration of transportation and production problems there.

The ceilings are set on a basis of APA units per ton (a ton containing 18% acid has 18 APA units) and the table on page 55 is extracted from the order to show how this works out in various geographic areas.

Production Point	Ceiling Price Per unit of APA[1]
Alabama:	
Birmingham	$0.85
Dothan	.84
Florence	.85
Mobile	.81
Montgomery	.84
Roanoke	.85
Troy	.84
Arkansas:	
Little Rock	1.03
Texarkana	1.03
Walnut Ridge	1.03
California:	
Stege	1.32
Vernon	1.32
Florida:	
Agricola	.72
Bartow	.72
Cottondale	.84
East Tampa	.72
Jacksonville	.78
Nichols	.72
Pensacola	.69
Pierce	.72
Georgia:	
Albany	.84
Americus	.84
Athens	.84
Atlanta	.84
Augusta	.84
Carrollton	.84
Columbus	.84
East Point	.84
LaGrange	.84
Macon	.84
Moultrie	.84
Pelham	.84
Rome	.84
Savannah	.80
Tifton	.84
Valdosta	.84
Idaho:	
Pocatello	1.14
Illinois:	
Calumet City	.98
Chicago Heights	.98
East St. Louis	.98
Fulton	.98
Monsanto	.98
Streator	.98
Indiana:	
Fort Wayne	.98
Hammond	.98
Hartsdale	.98
Indianapolis	.98
New Albany	.98
Shererville	.98
Iowa:	
Mason City	1.16
Perry	1.16
Kentucky:	
Louisville	.98
Winchester	.98
Louisiana:	
Harvey	.89
Lake Charles	.94
New Orleans	.89
Shreveport	1.03
Maine:	
Searsport	1.03
Maryland:	
Baltimore	.86
Hagerstown	.87
Massachusetts:	
Lowell	.99
North Weymouth	.99
Woburn	.99
Michigan:	
Detroit	.98
Mississippi:	
Clarksdale	.95
Greenville	.95
Gulfport	.91
Hattiesburg	.95
Jackson	.95
Tupelo	.95
Missouri:	
Atlas	1.06
Columbia	1.08
Kansas City	1.08
Webb City	1.06
St. Joseph	1.08
Springfield	1.06
New Jersey:	
Carteret	.87
Paulsboro	.87
New York:	
Buffalo	1.03
North Carolina	
Charlotte	.85
Durham	.87
Greensboro	.87

Laurinburg	.85
Selma	.87
Wadesboro	.85
Wilmington	.81
Wilson	.87
Ohio:	
Cincinnati	.98
Cleveland	.98
Columbus	.98
Lockland	.98
Sandusky	.98
Silica	.98
Toledo	.98
Washington Court House	.98
Oklahoma:	
Tulsa	1.03
Pennsylvania:	
Philadelphia	.87
South Carolina:	
Anderson	.85
Charleston	.80
Columbia	.85
Greenville	.85
Hartsville	.85
Lancaster	.85
Spartanburg	.85
Tennessee:	
Chattanooga	.90
Greenville	.90
Memphis	.95
Mount Pleasant	.90
Nashville	.90
Wales	.90
Texas:	
Dallas	1.03
Fort Worth	1.03
Houston	.95
Pasadena	.95
Sulphur Springs	1.03
Utah:	
Midvale	1.28
Virginia:	
Alexandria	.86
Lynchburg	.87
Norfolk	.85
Portsmouth	.85
Richmond	.87
Washington:	
Tacoma	1.53
Wisconsin:	
Green Bay	1.26
Madison	.98
Prairie du Chien	1.08



NPA Phosphatic Fertilizers Industry Advisory Committee, photographed at their March 25 meeting in Washington, D. C. Seated at the table, left to right, are: R. R. Hull, I. P. Thomas & Son Company; R. L. King, Georgia Fertilizer Company; A. R. Mullin, Indiana Farm Bureau Cooperative Association; S. L. Nevins, Mathieson Chemical Corp.; J. W. Rutland, Plant Food Division, International Minerals & Chemical Corp.; R. S. Rydell, Plant Food Division, Swift & Company; J. H. Scherm, American Agricultural Chemical Corp.; W. R. Thurston, Thurston Chemical Company; Roger Mullin, Counsel, Chemical Division, NPA; W. R. Allstetter, Deputy Director of Materials & Facilities, USDA; G. M. Hebbard, Chief, Inorganic & Agricultural Chemicals Branch, Chemical Division, NPA; Fred Fraley, Deputy Director of Chemical Division, Chemicals, Rubber & Forest Products Bureau, NPA; M. R. Dallin, Office of Industry Advisory Committees, NPA; Philip H. Groggins, Chief, Agricultural Chemicals Section, Chemical Division, NPA; C. T. Cunningham, Armour Fertilizer Works; F. W. Darner, Tennessee Corp.; J. C. Dean, Knoxville Fertilizer Company; R. B. Douglass, Smith-Douglass Company, Inc.; M. F. Field, Meridian Fertilizer Company; E. W. Forkin, Forkin Phosphate Company; H. E. Fraser, Summers Fertilizer Company; R. L. Hockley, Davison Chemical Corp.; J. A. Howell, Virginia-Carolina Chemical Corp.

OBITUARIES

Pierre N. Holst, 72, formerly with Southern Fertilizer and Chemical Company, died March 28 in Savannah, Georgia.

Rufus Howard, 63, since 1943 Nebraska Director of Agriculture, died March 28 after a long illness.

Robert R. Kurtz, since 1945 with John Powell & Co., suddenly April 8.

Hugh A. McLeod, 52, head of McLeod Bros. Fertilizer Co., Jacksonville, Florida, in an automobile accident April 11.

Frank G. Odell, 87, pioneer Nebraska soil conservationist, March 29, in an Omaha hospital.

John Henry Pratt, 95, active in the discovery of pebble rock phosphate in Polk and Hillsborough Counties, Florida, died March 31 in Tampa after a long illness.

Nimrod Harry Stiles, partner in the Polk County Fertilizer Co., suddenly at his home in Haines City, March 27.

MARKETS

ORGANICS: Rather little interest is shown in organics for fertilizer use at present. Some quantities of domestic nitrogenous sold recently for fall shipment and current prices are nominally $4.25 to $4.90 per unit ammonia, bulk, f.o.b. usual production points. Imported Nitrogenous Tankage is indicated on limited quantities at $6.00 to $6.25 per unit ammonia, in bags, CIF usual Atlantic ports.

CASTOR POMACE: Reduced production of castor oil and accompanying low production of Castor Pomace maintains the market in a relatively tight position. Limited quantities of domestic material are offered from time to time at $37.25 per ton in burlap bags or $2.00 per ton less if in paper bags, f.o.b. northeastern production points. Material is guaranteed minimum 6.75% Ammonia.

DRIED BLOOD: Unground Dried Blood is indicated at around $6.00 per unit Ammonia, bulk, f.o.b. Chicago area. In the New York area price is around $6.50 per unit.

POTASH: Demand, particularly in the Midwest, continues strong and some producers report shipments as much as 15 days behind schedule. Stocks at Atlantic and Gulf ports are fairly comfortable and demand from coastal manufacturers fair. It is reported that the Domestic Producers are making an effort to secure an increased ceiling for new season's business.

GROUND COTTON BUR ASH: This excellent source of Potash, primarily in the form of carbonate of Potash is available for prompt and future shipment in fair quantity. Best grade material consistently tests around 40% K_2O and this material delivers in most cases approximately the same as Sulphate of Potash.

PHOSPHATE ROCK: Movement continues steady to acidulators and the market is in balance. No changes in prices have been indicated.

SUPERPHOSPHATE: Market continues strong with prices at ceiling levels. Normal Superphosphate at Baltimore is quoted at a new ceiling of 87.7¢ by one manufacturer. Triple Superphosphate demand is far in excess of supply and current price is 87¢ per unit, bulk, f.o.b. Tampa, Fla.

SULPHATE OF AMMONIA: Prices continue at $40.00/$45.00 per ton bulk f.o.b. steel mills and demand quite strong maintaining the market in tight position.

AMMONIUM NITRATE: Demand is at its peak and supply far short of demand. Prices continue $63.00/$64.00 per ton bagged f.o.b. domestic production points Canadian material is priced at $72.50 per ton bagged f.o.b. Port Robinson, Ontario, Canada.

NITRATE OF SODA: Supply situation on this material is extremely tight due to a strike in Chile. Domestic production is far short of demand. A fire at Savannah damaged stocks of imported material considerably, a few weeks ago.

GENERAL: All forms of Nitrogen are quite short of demand. Superphosphate still is in tight supply position and Potash except for coastal areas is also short of demand. Many areas are at peak shipping schedules on mixed fertilizers.

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